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The Report of the Fuel Research Board

IN many respects the Fuel Research Station must be regarded as one of the most " live " of the Government departments. It keeps in close touch with industry and with the more academic worker of the university. It surveys fuel problems from coal to carbon dioxide, including such interesting by-paths as the production of oil from coal. In the Report for the year ending March, 1938, just issued, there is detectable greater bias to the colliery aspect of fuel than formerly. The work of the coal survey, which will be of the utmost value if marketing arrangements permit users to purchase the coals they select, has been described in some detail, and there is an increasing amount of work being done upon the preparation of coal for the market. As a contribution to general cleanliness, it will be noted with interest that the prevention of dust on handling by oiling or by treatment with calcium chloride solution is under examination. The Board, too, is showing an interest in methods of coal cleaning that may enable users to purchase still cleaner coals in the future. In all these ways, the work is assisting to bring the collieries up to date, and in that way is assisting industry by enabling it to get better coal for its money.

Turning to matters of more chemical interest, some investigations on the effect of inorganic compounds on the oxidation of coal have shown that sodium carbonate, ferric chloride and manganous chloride accelerate the reaction at temperatures of 100, 200 and 250° C., whereas aluminium sulphate, ammonium dihydrogen phosphate and sodium dihydrogen phosphate all act as inhibitors. It is known that sodium carbonate and ferric salts equally accelerate the combustion at high temperatures, and that the substances found to be inhibitors are equally renowned for their fire-proofing qualities.

A mixture of hydrogen and carbon monoxide in the proportion of 2 vols., to 1 vol. has acquired no little industrial interest as a raw material for chemical industry, e.g., in the synthetic manufacture of hydrocarbon oils by the Fischer-Tropsch process and of alcohols. It has been found that gas of this composition can be made conveniently by combining the usual water-gas process with the Lane hydrogen process. The Lane process involves alternate reduction and oxidation of spathic iron ore at 700-800° C.; in the F.R.B. process, the water-gas generator is followed by a chamber packed with iron ore which is heated to the required temperature during the blow period, the reduction of iron ore being effected by passing through it the water-gas produced by the up-run. To produce hydrogen, the " back-run " steam is then passed through the reduced ore, the hydrogen and steam passing onward through the generator. When using coke in the generator, a gas was produced containing 61.9 per cent. of H_2 and 32.3 per cent. of CO. There is also the possibility of using coal instead of coke in the generator, this process being also due to the Fuel Research Station.

A semi-technical scale Fischer-Tropsch plant has been installed for the study of the production of synthetic lubricating oils. For this purpose the olefines produced in the Fischer-Tropsch installation have been polymerised using aluminium chloride as catalyst. The maximum olefine production was produced by catalysing a gas with a low H_2 : CO ratio, even as low as 1.3 : 1, but there is some doubt regarding the validity of this conclusion, since even larger olefine production has been achieved with the standard 2 : 1 ratio. This phase of the work had not advanced sufficiently far for conclusions to be drawn, but the results are encouraging. The process, of course, is well known in Germany, where it is operating for the production of lubricating oils on the commercial scale. An interesting extension of this work is an attempt under Professor Rideal to elucidate the mechanism of the Fischer-Tropsch reaction; this has reached the stage when " it seems reasonable to conclude that if the chemi-sorbed carbon monoxide is attacked by adsorbed hydrogen atoms, the product will be methane, but attack by molecular hydrogen leads ultimately to higher hydrocarbons."

An extension of the hydrogenation process that may ultimately be of interest to tar distillers is the purification of benzole by mild hydrogenation, pelleted molybdenum disulphide proving the best catalyst. It is found that benzole can be satisfactorily de-sulphurised, without causing the activity of the catalyst to be reduced, by treatment with hydrogen under a pressure of 20 atmospheres at 350° C. In one instance a sulphur content of 0.73 per cent. was reduced to 0.06 per cent., and the potential and existent gum content from 14 mg., per 100 ml. to 4 mgm., without affecting the octane number of the benzole.

It is estimated that two-and-a-half to three million pounds sterling are spent in the U.S.A. alone on research and development in the refining of petroleum. . . . In no country except possibly the U.S.S.R., does expenditure on coal utilisation research come within one-tenth of the figure I have quoted for oil utilisation research.

—J. H. M. Greenly.

NOTES AND COMMENTS

Unity in the Profession

MR. CALDER has added the weight of his opinion to the other recent expression of the need for unity in the chemical profession. In his Huster Memorial lecture, delivered at a meeting of the Liverpool section of the Society of Chemical Industry, he pointed out the advantage of chemists banding together into one strong federation. Each of the chemical organisations has its own particular sphere of activities and provides very valuable services to the chemist. Generally speaking, the activities of the organisations do not overlap and the chemist joins, and rightly joins, that organisation or organisations which fills his own particular requirements. The arrangement works well until an issue arises concerning the welfare of the whole profession on which an opinion of the majority should be expressed. Such a position creates a difficulty. One of the chemical bodies may decide to deal with the matter on its own account, and as a result may be criticised for what might be considered as unwarranted extension of its primary functions. But as things are at the moment there is no alternative method. In the Chemical Council the foundations have already been laid of a federation which could properly deal with matters affecting the general interests of the profession. The time is now ripe for a strong superstructure to be built on these most suitable and practical foundations.

Overseas Trade in November

A FURTHER improvement in Britain's trade is shown by the Board of Trade returns for November. Although there is normally a seasonable drop in exports from October to November this did not take place, but instead the exports increased for the third month in succession and reached the highest total for the year at slightly under £43 millions. At the same time imports declined by just over £1,000,000 and by nearly £20 millions compared with November, 1937. Further, the import surplus has been reduced by about £30 millions in the first eleven months of this year compared with the corresponding period of 1937. Imports of chemicals, drugs, dyes and colours decreased by £120,247 to £1,213,381 compared with November, 1937, and while exports also decreased, the decrease was not heavy, being £62,690 in comparison with the November, 1937, figure. They are in excess, however, of the figures for the same month in 1936 by £193,655. It will be seen from the details of the month's chemical trade, published on another page, that substantial decreases in quantities of imports, compared with November, 1937, occurred in boric acid and borax, potassium sulphate, sodium nitrate, and lithopone, while increases in quantities of exports took place in ammonium sulphate, cresylic acid disinfectants and insecticides, caustic soda, sodium nitrate, and quinine and quinine salts.

Encouraging News from America

ANOTHER encouraging sign is the recovery in America which usually heralds better trade elsewhere. The latest figures from Washington show that in the past six months industrial production has risen by 24 per cent., which is nearly a record for so short a period. According to the index of industrial production issued by the Federal Reserve Board (which is based on a figure of 100 for 1923-25), the level has improved from 76 last May to 100 in November, this comparing with 119 in the boom year of 1929. The Federal index represents the rate of operation of America's principal industries and is regarded as the "best single gauge of national well-being." The rise in the past six months represents nearly half as much as the improvement in the four previous years, so that a large part of the ground lost in the 1937 depression has now been regained. The view is held that there may be a "levelling off" in the recovery, but according to the *United States News*, the experts are "unanimous in forecasting a renewal of the recovery trend after a brief period of hesitation, with general agreement that 1939 will be an 'up' year." British exporters may thus look forward to a better year, as these improved conditions coincide with the advantages afforded by the Anglo-American trade treaty. To these factors must be added the forthcoming visit of the King and Queen to the United States, which will enormously strengthen the ties between the two countries.

Claim for Workmen's Compensation

A JUDGMENT given in an appeal (which was allowed) in the House of Lords last week is of interest to all employers of labour. The subject-matter of the appeal was a claim made by the appellant under the Workmen's Compensation Act, 1925, for compensation for incapacity for work caused by an accident which occurred at the Swanscombe works of Associated Portland Cement Manufacturers, Ltd., the respondents. The appellant was employed at times to stand in water and used sacking to protect his trousers. He was permitted by his employers to dry the sacking either at a stove or at the unfenced orifice of the revolving fan of a turbine. On the day of the accident he was drying the sacking at the fan but placed the sacking, held in his hand, too near the fan. The sacking was caught by the fan and the appellant's hand was also caught and severed. In delivering judgment, Lord Atkin said that in his opinion the injury to the workman was caused by accident arising out of, and in the course of, his employment. *Once it had been found that the work which a man was seeking to do was within his employment, the question of negligence was irrelevant.*

Plant Growth-Promoting Substances

A USEFUL review of the present stage of studies on substances stimulating plant growth and the possibilities of their practical application is contained in the November issue of the *International Review of Agriculture* (International Institute of Agriculture). The following are the principal growth-promoting substances which have been utilised in the different experiments on cultivated plants described in the literature: Auxin-*a*, auxin-*b*, indolyl-acetic acid, indolyl-butyric acid, indolyl-propionic acid, α and β naphthyl-acetic acid, phenyl acetic acid, phenyl-propionic acid, fluorene-acetic acid, lanolin, benzoyl oxide and peroxide, picoline carboxylic acid, rhizocaline, tyrosine, panthothonic acid, "Co-enzyme R," and vitamin B1. The agricultural or horticultural plants, in which the stimulation results were obtained, are given as well as notes on the occurrence and application of the growth-promoting substance. A few of the substances have not yet been synthesised, notably auxin-*a* (auxentriolic acid). Owing to the variety of methods of using the substances and the varying strength of the solutions employed, the review suggests that a definite technique to be followed in treating different crops should be determined.

Urea and Formaldehyde as Textile Auxiliaries

By
J. WAKELIN

THE usefulness of soap, synthetic detergents, oils, dyes and salts in the textile processing industries is well enough known to require no further comment, but as fashions and technical processes develop, new chemicals and commodities tend to acquire a new and changing degree of importance. So it is with urea and formaldehyde. A few years ago these chemicals interested makers of resins and plastic goods more than anyone else, but recent advances in the field of textile finishing seem destined to alter this. Finishing is rapidly becoming more and more a chemical process requiring specialised knowledge for its success and the variety of substances called into play is daily increasing in number and diversity.

Resin finishing in the textile industry is still a comparatively new line of development and the commercialisation of even the earliest discovery in this field is as yet not mature, but on the research and development side progress is being made by leaps and bounds. Almost every week some useful item of knowledge is disclosed and the sum total of acquired data in this field is already much too great to describe adequately in the compass of an article. In the present account it is proposed to review briefly some of the recent discoveries in order to show their variety and in order that their relative interest to the textile manufacturer on the one hand, and on the other to the chemical producer, who may at any time be called upon to supply the chemicals or plant employed, may perhaps be assessed.

Urea and formaldehyde are the reagents most commonly used in treating cotton or regenerated cellulose rayon to minimise the tendency of those fibres to crease and to exhibit a crumpled appearance when mechanically distorted and doubled up. Wool suffers little from this defect, nor is silk subject to it to anything like the same extent. The first public demonstration and disclosure of the use of resins in this connection was made about six or seven years ago, and those who desire to consult the original patents should see British Patents 291,473, 291,474 and 304,900, all to Tootal Broadhurst Lee Co., Ltd. A more recent patent to these inventors no doubt embodying many improvements discovered in the course of their studies, gives the following details for the creaseless finishing of fabric.

Resin Impregnation

200 c.c. of technical 40 per cent. formaldehyde solution is made neutral and 100 gm. of urea are dissolved in it, and the solution adjusted to a *p*H value of 4.5 by adding tartaric acid. This solution is diluted first to a known degree, say to 70 per cent., at which concentration it is stable and is allowed to stand for 5 hours at 15° C. Presumably during this time some combination takes place. After this period the solution is diluted again, this time to 50 per cent. of the original strength.

The catalyst, a salt which during heating liberates acid which accelerates the resin formation, is added, namely, 2 to 3 gm. of ammonium dihydrogen phosphate per 100 c.c. of solution. The solution is now ready for the fabric and should be used without any great delay, otherwise premature condensation may take place. The textile material is impregnated with this solution, is squeezed and dried at a low temperature to remove moisture. Then the fabric is subjected to a temperature of 120° C. for an interval of 2 minutes for condensation and formation of an insoluble resin on the fibre, after which it may be washed and finished in the usual manner.

The water-insolubility of the final resin is an important factor in connection with the permanence of the effect and it is not hard to see that other effects and finishes are rendered more permanent if followed or accompanied by resin impregnation. Dyeings are reported to gain fastness and resistance to washing if, after the dye is applied to the fibre, a resin finish is added. This possibility is especially attractive in the case of the direct or substantive dyes which are the easiest of all dyes to apply to cotton and rayon and possess in many cases a very high degree of fastness to light, but suffer from an indifferent resistance to soap and washing chemicals. Here then, is the ideal field where the resins can be most usefully applied as an aid to the dyer and textile colourist. The proportion of resin necessary is not so high as the 15 per cent. demanded, for instance, by crease-resisting, but the technical process follows broadly the same lines.

A cuprammonium rayon fabric is first dyed in the usual way with a direct dye—Chlorazol Fast Scarlet 4BS is quoted in one patent. The fixation of this is effected with a solution made up as follows. 10 parts by weight of ammonium acetate and 25 parts of urea are dissolved together in 115 parts of water and to it is added 100 parts of 40 per cent. formaldehyde solution. After standing for 30 minutes at room temperature during which incipient combination takes place, the mixture is ready for the dyed fabric. The latter is immersed in it, dried and heated at 200° C. for 30 seconds. The resulting coloured fabric is fast enough to withstand washing in boiling soap solution.

A New Mode of Rubber Application

Rubber is not by any means a stranger in the sequences of textile finishing, but its principal utility lies in the field of heavy fabrics, carpets, tyre-cord and so forth. Attempts have been made to incorporate it in light fabrics, particularly rayons, without any outstanding success being made. There are of course many difficulties attending its use in textiles, smell, rubbery handle and similar disadvantageous attributes.

The recent British Patent 486,926 outlines a manner of using rubber which breaks away from any foregoing practice in that it is applied in conjunction with a resin finish. The advantage gained thereby is said to be improved wearing properties in addition to resistance to creasing. Rubber in the form of latex is chosen for this process and special care is devoted to avoiding coagulation. The basic materials used otherwise are as usual, urea and formaldehyde, with tartaric acid or ammonium phosphate as catalyst, and it is proposed to employ a sulphated fatty alcohol wetting and dispersing agent when tartaric acid is employed.

A preliminary condensation product is prepared by heating 100 gm. of urea and 200 cc. of neutral formaldehyde with 9 cc. of ammonia for 3 minutes under reflux, and then cooling. 50 cc. of the resulting solution of dimethylolurea is diluted with 48 cc. of water and 2 cc. of rubber latex. The catalyst in this case is neutral (ammonium phosphate) and so no dispersing agent is included. This salt is dissolved in a little water and added to the rest of the mixture. The cotton or other textile material is now impregnated with this solution, squeezed, dried at a low temperature and then heated for 2 or 3 minutes to 120° C. in a hot air chamber.

Matt-Finishing Rayon

Many chemicals which are not customarily found in dyeing and finishing have been proposed at some time or another for the purpose of giving rayon a delustred, matt appearance. The patent literature is full of suggestions and compounds for this and have been chosen from a very wide field. Titanium dioxide is a common example, but prior to the dull lustre epoch, was almost unknown in textile technological processing—an illustration of the fact that fashion is fickle, and an instance of an unlooked for change which may happen in an industry and revolutionise it in the chemical sense.

When urea and formaldehyde combine together in slightly alkaline media, mono- or di-methylolurea is forced according to the relative proportions of the reactants. The formula usually given for this substance, which is an intermediate stage in resin formation is: $NH_2-CO-NH-CH_2OH$ (mono-methylolurea).

In slightly acid conditions, urea and formaldehyde unite to give methylene ureas to which an unsaturated configuration is ascribed: $NH_2-CO-NH=CH_2$ (mono-methylene urea). Since acid is invariably used at some stage in the formation of a resin impregnation, it seems fairly clear that the methylene form is more truly an intermediate than the methylol.

When acid is added to a solution of mono-methylolurea a white water-insoluble "precipitate" of methylene urea is produced. It has been revealed recently that this substance is an excellent agent for delustring rayon. There are a number of ways in which it may be used, such as by adding a dispersion to the alkali-viscose mass prior to spinning into filaments. It may be of interest to show how the dispersion itself is prepared. 5 to 25 parts of mono-methylolurea, freshly prepared, is dissolved in water (100 parts) with 1 part of sodium sulphated lauryl alcohol. To the cool solution is added 1 part of tartaric acid dissolved in 3 parts of water, in portions, meanwhile the mixture is stirred. A suspension of methylene urea is thus obtained.

As an alternative to preparing the dispersion separately and then applying it to the material, the rayon may receive it by double impregnation involving its precipitation within the fibre. Urea and formaldehyde solutions mixed, unheated, are prepared and the rayon is immersed, squeezed, and then treated in a second bath of dilute hydrochloric acid. Any degree of effect may be obtained by controlling the process, from a faint opalescence to a full matt finish, accompanied also by some measure of weighing. (See British Patent 484,901).

"Why a Chemist?"

Mr. Calder's Hurter Memorial Lecture

MR. W. A. S. CALDER, F.I.C., M.I.Chem.E., in the Hurter Memorial Lecture, entitled "Why a Chemist?" which he delivered at a meeting of the Liverpool Section of the Society of Chemical Industry, on December 16, over which Mr. B. D. W. Luff presided, said that there was no profession whose portals should be barred to those without a very definite and irresistible urge to enter, than the chemical profession. Chemistry, with the lure of its attractions, the gaudy fireworks of its early experimental displays and its tempting offers of a definite solution of many problems, enticed the eager and expectant school-boy into its folds. Little did he reek of the long, dark tunnel into which he entered, where no fireworks emblazoned the non-existent sky. Still, was it not the need of constant endeavour that made experimental science such a fascinating mistress, whose attractions never cloyed?

Discussing his early days, Mr. Calder said that when at school he resolved to become a chemical manufacturer. His parents decided that a year in an East Indian merchant's office would decide if his desire for a chemical career was a permanent attachment, or merely a passing flirtation. It turned out that the chemical bacillus was still in the system and it could not be eliminated.

"Academic training was not looked upon as a *sine qua non*," he continued, "but as an alternative to entering a works laboratory. I was very keen on the latter method, but no opening was available. One of the large companies I remember, replied that at a recent meeting of the board it had been resolved that only sons of directors could be admitted.

"In these times there is surely the greatest possible need for chemists, and under this title I would include all those who have derived benefit from a chemical education. How is it that so many of our friends proudly declaim 'I am no chemist?' Not infrequently they continue by modestly enumerating a tedious list of the high academic honours in chemistry which they obtained. Is it not possibly that chemists have so far resolutely refused to band together into one strong federation, and so to let the world know they really exist. Or is it that the type of man to whom I referred does not realise how much he actually owes to the chemical portion of his training for his ultimate success in other spheres. One of the pressing needs for chemistry is the unfortunate fact that we are living at a time when rumour, that lying jade, is as rampant as in the days when 'Boney' was the national nightmare.

"Surely a chemical training does serve to some extent at least as a form of inoculation against the deathly attacks of baseless rumour. Surely as chemists we can refuse to be stampeded into a state of blind panic, or to have our passions raised to fever heat by the ravings of the propagandist."

Distillation of Petroleum Emulsions

Avoiding Magnesium Chloride Decomposition

A METHOD of avoiding the decomposition of magnesium chloride during the distillation of petroleum emulsions is described by Ciochina (*Chemie et Industrie*, 1938, *40*, 862-864). In the distillation of these emulsions, foaming usually occurs to such an extent that a complete separation is quite impossible. Further, the magnesium chloride present is liable to decompose, giving off hydrochloric acid. To avoid this, the emulsion is distilled from a metal flask, and sufficient sodium chloride is added to saturate the aqueous phase in the hot, as well as 0.5-1.0 gram of magnesia per litre of emulsion. No foaming at all occurs, and the magnesium chloride precipitates as an insoluble oxychloride—a magnesium cement, in fact. Thus no evolution of hydrochloric acid occurs. A metal flask has to be employed, as a glass one will not stand up to being heated when a crust of salt forms on it. The method may be used to treat both oil-in-water and water-in-oil emulsions.

It was found that the normal temperature at which the hydrolysis of magnesium chloride in solution occurs is 106° C., but the presence of very small amounts of soaps, such as would be found in petrol emulsions, reduces the decomposition temperature to below 90°.

THE SODIUM SALT OF CELLULOSE GLYCOLLIC ACID

A French patent for a new method of preparing the sodium salt of cellulose glycollic acid, and similar salts of carbozylated cellulose ethers has been granted to the firm of Kalle and Co. (F.P. 828,288). According to the process, alkali cellulose is first prepared by mixing cellulose, sodium hydroxyde, and sodium chloride with water. After agitating for 30 minutes a solution of monochloracetic acid in water is added to the mixture, and neutralised with sodium bi-carbonate. This is stirred for an hour and then sodium carbonate is added, and mixed for a further half hour at 35° C. A further quantity of monochloracetic acid dissolved in water is then added and neutralised with sodium bicarbonate. Mixing at 35° C. is continued for three hours, and if the reaction is not completed, may be continued still longer, allowing the temperature to go up to 40° C. The resultant liquid is treated with 80 per cent. alcohol to which acetic acid has been added in sufficient quantity to neutralise the alkali and the sodium salt of cellulose glycollic acid is obtained. Cellulose glycollic acid is prepared from this salt by mixing it with a solution containing 12 per cent. of sodium chloride and 2 per cent. of hydrochloric acid, and maintaining the mixture at 70° C. while it is being filtered.

Research on the Preparation and Utilisation of Coal

Annual Report of the Fuel Research Board

THE remarkable extent to which scientific knowledge and research are being applied to every phase of the preparation and utilisation of coal is brought out in the latest report of the Fuel Research Board, which with the report of the Director of Fuel Research, has been issued by the Department of Scientific and Industrial Research. (Report of the Fuel Research Board for the year ended March 31, 1938. H.M. Stationery Office, 4s. net).

One of the primary functions of the Fuel Research Board, which was established in 1917, was to make a comprehensive survey of the national coal resources. It was recognised that this task was one of great complexity from both its industrial and its scientific aspects, and that to be successful the organisation must be planned so as to meet the needs of the future. Each of the coalfields contains many separate seams —for example, one of the smaller coalfields has twenty distinct seams of workable thickness—and the problems of the survey were therefore at the same time general and local. These considerations suggested that each coal area must be treated as a separate unit, calling for the undivided attention of a separate staff.

The organisation was not complete until 1932, and now embraces nine separate laboratories so situated that the seams in any coalfield can be conveniently examined locally. The staffs of the coal survey laboratories work in the closest co-operation with mining and research workers engaged on associated problems in the coal areas, and the survey is carried out in consultation with the geological survey.

No Lack of Continuity in Survey

The methods originally adopted for the survey have stood the test of time, and there has thus been no lack of continuity in the work, although fresh methods of examination and analysis of the coal samples have been added from time to time as new problems arose. The first stage of the work is the survey of the coal seams as they exist below ground. For this purpose pillars are cut from the face of the seam at different points in the coalfield. These pillars are transported to the laboratory where their physical and chemical characteristics are exhaustively investigated. The second stage consists of the examination of the commercial grades of coal actually sold by the collieries. For this purpose the staff of the coal survey laboratories, assisted by the staffs of the collieries, obtain average samples of all the products marketed by the collieries. These samples are taken to the coal survey laboratories and examined in detail. Frequent tests on coal from the seams being surveyed are carried out at the Fuel Research Station on industrial scale plant, and form an important feature of the work.

Up to the present 43 survey papers have been published and 12 more are almost ready for the press. Of these, 35 are devoted to separate seam surveys and five to commercial samples, the remainder dealing with carbonisation tests, methods of analysis, microscopical examination, etc.

Altogether, complete surveys have been carried out on 65 seams and work on over 30 others is in hand. In addition a very large number of samples have been taken of other seams as opportunities have arisen. Full and reliable data on approximately 30,000 million tons of coal have been collected and co-ordinated, representing about a quarter of the proved coal reserves of Great Britain, and a much larger proportion of those likely to be in active development in the near future.

The study of the macro- and micro-structure of coal has continued, including petrological analysis and microspore distribution as applied to the constitution and correlation of coal seams.

Sir Harold Hartley, F.R.S., chairman of the Fuel Research Board.

Methods for the analysis of coal, coke and ash are under constant review, with a view to simplification and the attainment of greater accuracy.

The study of factors influencing the softening point of coal has been continued in connection with the mechanism of, and selection of coal for carbonisation. Particular attention has been given to possible relations between the softening point and the elementary constitution of coal.

The oxidation of pure organic compounds has been investigated to provide a guide to compounds formed by the oxidation of coal; the attack on the problem of coal constitution has also been extended by researches on the action of sulphuric acid on coal, and on the products of the vacuum distillation of plant-remains separated from coal.

Investigations are being made of the oxidation of carbon with nitrous oxide, with atomic oxygen and by anodic oxidation to provide fundamental information on the mechanism of the oxidation of carbon.

The researches on the preparation of coal for the market have been extended to cover the preparation of coal and its physical characteristics, and they now include the following lines of attack: (1) a study of the deliberate breaking of coal in order to augment the supplies of graded coals; (2) a study of the extent to which coal breaks during transport, storage and handling; (3) an examination of the extent to which different types of coal deteriorate by "weathering;" (4) the development of a new system for the dry cleaning of coal; (5) an investigation of methods for the "dust-proofing" of coal; and (6) a general study of the cleaning of fine coals.

Carbonisation and Gasification of Coal

The conservation of the coking coals of the country, which are normally required for the production of metallurgical coke, is of importance owing to the gradual depletion of the reserves of coal of this type. An investigation is proceeding on the blending of coking coals with the more abundant weakly-caking coals with the object of determining to what extent the latter can be utilised in the production of coke suitable for metallurgical purposes. Typical coals from six different coalfields have so far been used in the experiments.

It has been possible to arrange for selected coals to be carbonised in six commercial coke ovens situated in Scotland, Durham, South Yorkshire, Lincolnshire, and South Wales. The object is to obtain accurate information on the effect of differences in the width of the oven and in carbonising conditions on the quality of the coke from different types of coal. The arrangements are being made by a Committee of the Board on which the Coke Co-ordinating Committee of the British Iron and Steel Federation is represented.

The narrow vertical brick retorts designed at the Fuel

Research Station for the production of domestic solid smokeless fuel continue to give satisfactory service. One retort to which slight repairs have recently become necessary has been operated practically continuously for six years and has carbonised some 5,000 tons of all types of coal. The suitability of coals from the various fields for the production of domestic coke is being investigated. Information is now available on the operation of a commercial setting of retorts of this type erected at the South Yorkshire Chemical Works, Ltd.

As part of the programme of the Joint Committee of the Institution of Gas Engineers and the Board, experiments have continued on the complete gasification of weakly-caking coals in a water-gas plant. A normal type of water-gas plant has been modified so that bituminous coals both high and low in volatile matter can be treated. The investigation has also indicated that, by introducing iron ore into the preheating chamber of this modified plant and by operating on a suitable cycle, hydrogen can be produced in quantity sufficient to raise the hydrogen-carbon monoxide ratio of the water-gas made from coke to a value suitable for direct use in the synthesis of liquid hydrocarbons.

The complete gasification of pulverised coal in steam and oxygen at atmospheric pressure is being studied in the vortex chamber. Later the same apparatus will be adapted to work under pressure.

An investigation is also being carried out under the Joint Research Committee of the Institution of Gas Engineers, the University of Leeds, and the Board, at Leeds University. This work has indicated that when coke is heated in the presence of hydrogen, a large proportion of it can be converted into methane. The experiments in progress are designed to explore the many aspects of this important observation.

Investigation of the Treatment of Tars and Oils

The programme relating to tars and oils is confined at present to an investigation of the hydrogenation process. The main objects of this programme are as follows: (1) the study of the effect of the conditions employed for the preparation and use of a fixed catalyst upon its activity; (2) the examination of the suitability for hydrogenation of tars obtained from various carbonaceous materials under different conditions of carbonisation; (3) the examination of the possibility of producing, from tar, products other than motor spirit, such as diesel oil and lubricating oil; (4) the hydrogenation of pure substances to elucidate the nature of the reactions occurring during the treatment of tars and oils; and (5) a study of the cracking of hydrogenated oils.

During the past year the materials examined have included low-temperature tar and high-temperature vertical retort tar obtained from bituminous coal, low-temperature cannel tar and Kimmeridge shale tar or oil. It has been found, in the experimental plant, that oils suitable for high-speed diesel engines can be made by the hydrogenation of cannel tar, Kimmeridge shale tar or oil, and low-temperature bituminous coal tar, the cannel tar and shale distillate yielding the better oils. The Kimmeridge shales, unlike the Scottish shales, contain a high percentage of sulphur, most of which passes into the shale oil on retorting. The high sulphur content of this oil has hitherto made it unsuitable as a source of motor spirit or diesel oil.

It has been found that the sulphur in crude benzole may be satisfactorily removed by hydrogenation at a pressure of 20 atmospheres and a temperature of 350° C.

The pure compounds investigated have included benzene, cyclohexane, *n*-hexane and phenol, which were treated mainly for the purpose of examining the reactions by which paraffin hydrocarbons are produced from aromatic and naphthenic substances. Promising results have been obtained from a preliminary investigation of the possibility of producing gaseous olefines by the vapour-phase cracking of hydrogenated tar fractions.

In addition to providing a way of obtaining liquid fuels from coal at atmospheric pressure, the synthesis of hydrocarbons from carbon monoxide and hydrogen is a first step in the synthesis of lubricating oils, which can be made by simple polymerisation of portions of the primary synthesis product. The investigations have extended from a study of the mechanism of the synthesis, through laboratory-scale and semi-technical-scale plant work, to an examination of the quality of the products under practical conditions.

Fundamental investigations of the reactions involved have been carried out in Professor Rideal's laboratory at Cambridge by a member of the Fuel Research Station staff. These experiments have given a clue to the difference between the mechanism of the reactions which produce liquid hydrocarbons or methane respectively from carbon monoxide and hydrogen. They are, therefore, of special interest in throwing light on the exact nature of the reactions taking place at the surface of a solid catalyst.

Polymerisation of Lubricating Oil

The problem of operating on a semi-technical scale have been studied in the Fuel Research Station plant, which has a capacity of 100 to 150 cu. ft. of synthesis gas per hour. The quantities of liquid product obtained have made it possible to extend to a correspondingly larger scale the experiments on the production of lubricating oils by polymerisation. Up to the present the polymerised products have not been obtained in sufficient quantities for engine tests, but so far as laboratory-scale examination can show they seemed to possess the properties of a good lubricating oil except as regards resistance to oxidation in the Air Ministry Test. The possibilities of producing lubricating oils by the polymerisation of gaseous olefines and by the chlorination and condensation of the paraffins produced by synthesis have also been explored. Experiments in another direction on the utilisation of the products of synthesis have resulted in the production of soap from the paraffin wax formed as a by-product in the synthesis of oils.

The study of the hydrogenation of coal has been continued to obtain greater knowledge of the factors which influence the course of the reactions from the point of view both of the nature of the coal itself and of the physical variables such as temperature, pressure, etc.

During the year the effect of variations of the physical conditions during continuous operation has been investigated in some detail. Attention has now been turned to a close study of catalysts in an attempt to accelerate the rate of reaction. These studies are carried out largely upon one coal, but a secondary object of the work is to investigate the amenability to hydrogenation of the various types of coal available in this country.

It has now become possible to investigate the characteristics of the solid product obtained by the partial hydrogenation of coal. This product is soluble in certain solvents and can be obtained substantially free from ash.

Steam Raising and Power Production

The commercial use of the "Multijet" and "Grid" pulverised fuel burners designed at the station continues to develop, and during the year two additional licences for their manufacture have been granted.

An examination of the various factors which determine the suitability of various British coals as bunker fuels for hand-fired marine boilers is being made with the size of the coal as the first variable to be investigated.

One of the main obstacles to the use of powdered coal in the diesel engine is the abrasive effect of the presence of solid particles. A study has been made of the possibility of reducing abrasion by making the best choice of materials for cylinder liners, pistons and piston rings, and promising results are being obtained. To examine the combustion side of the same problem a 90 h.p. two-cylinder diesel engine has been erected in readiness for conversion to work on powdered coal.

Jubilee of the Salt Union

Romance of Industrial Rationalisation—Merger of 63 Works Recalled

TO celebrate the jubilee of the Salt Union, Ltd., the oldest and largest combination of salt firms in the British Empire, a luncheon was held at the Crewe Arms Hotel, Crewe, on December 16, Mr. J. L. Deuchar, chairman of the Salt Union, Ltd., occupying the chair.

Among the earliest English attempts at what is now called "rationalisation in industry" was the formation, in 1888, of Salt Union, Ltd., which brought into one group 63 salt works in England and Ireland. At the time of the company's formation, salt refining had not advanced far beyond the methods employed by the Romans when they were in occupation of what is still England's greatest salt yielding district, the county of Cheshire. In the British Isles the chief deposits are in the Northwich and Winsford areas in Cheshire; Droitwich and Stoke Prior in Worcestershire; Middlesbrough district (Yorks); Fleetwood (Lancashire), Stafford (Staffordshire) and Carrickfergus (Northern Ireland). Although brine pumping and evaporation provide the greater proportion of the salt produced, the rock itself is still mined in the Meadow Bank Mine at Winsford, owned by the Salt Union, as well as the only other rock salt mine producing at Carrickfergus in Ireland.

Introduction of Salt Industry

In 1690 the salt industry was introduced into Liverpool by John Blackburne. He erected works on a part of the Salt Hous Moor, and began making salt from the rock salt just discovered. In 1705 his works were the largest in Liverpool, but the cost of transporting rock salt from Cheshire was not economical. The canal scheme which he consequently started was successfully completed after his death by his son, and the Weaver Canal was opened for navigation in 1722. Four successive John Blackburnes carried on the salt works. The fourth had to face the worst crisis, a huge rise in the Salt Tax which, fixed at 1s. per bushel of 56 lb. in 1699, had increased to 3s. 4d. In 1798 it was 10s. and it rose to 15s. in 1805. It was abolished in 1824. With the remission of the tax, the nineteenth century opened well for the salt trade, for the same year the alkali industry opened in Cheshire. Then the Indian market was thrown open. In the first year 21,686 tons were shipped to India—a figure that had to be increased tenfold in the next thirty years. But prosperity brought its own dangers and soon competition was so keen that salt was being sold below cost prices. When the Salt Union was formed it had almost at once to face a startling reversal of fortune, for the Leblanc process of soda manufacture gave way to the ammonia soda process. Solar salt was introduced, which affected the Indian market. The imposition of the McKinlay tariff in the United States extinguished, almost overnight, the very substantial U.S.A. market. To meet this, modernisation of plant with a view to cheapening production was introduced by the Salt Union, and in 1905 a triple effect vacuum evaporating plant, capable of producing 2,000 tons per week of salt, was installed at Winsford, followed in 1910 by a further larger unit capable of producing 4,000 tons per week at Runcorn. This latter plant was connected to the Mersey Power Co., Ltd., until recently a subsidiary of Salt Union, Ltd.

Salt Union, Ltd., operate works in the Winsford area, and at Weston Point, Cheshire; at Stoke Prior in Worcestershire and Haverton Hill in Durham. It also has works in Carrickfergus (Northern Ireland), and ships different grades of salt to Canada, Australia, Scandinavia, Denmark, Africa and the West Indies. Salt plays a great part in many of the industries of the world. It serves the chemical and dye trades in many ways, the soap industry, and in certain of the non-ferrous metals; in the preservation of hides and skins, the

(*Continued at foot of next column.*)

An Important Catalytic Development

Possible Far-Reaching Effects in the Oil Industry

A PAPER read before the recent meeting of the American Petroleum Institute in Chicago discloses the status of the Houdry process. It is the most important development since the introduction of the thermal cracking process into the oil industry and might be of considerable interest to the British fuel industry, as it is now possible to get a high gasoline yield from heavy residues. An investigation as to the possibilities of using heavy coal tar residues seems very important.

Not less than £8,000,000 are being spent by two of the major companies in the U.S.A. on construction, successful small plant trials having proved the practicability of the process. The process is covered widely by 96 U.S. patents, not including foreign patents, in the name of the Houdry Process Corporation, Wilmington, Del. The reactions operable by the process are catalytic cracking of crude and distillates, catalytic viscosity breaking of residues or tars in liquid phase, catalytic treatment of gasoline, catalytic desulphurisation of gases, catalytic polymerisation in liquid phase of butenes, and production of light gravity furnace oil or diesel oil from heavy-gravity gas oils, or residuums.

The chief characteristic of this development is the passage of cracking still products through a catalyst body composed of activated hydrosilicate of alumina in solid moulded form. The process is continuous, using two catalyst chambers, the regeneration being automatic. A typical catalyst consists of 76 per cent. silicon dioxide, 16.8 per cent. of aluminium oxide and small percentages of the oxides of iron, calcium and magnesium.

AUSTRALIAN TARIFF AMENDMENT REDUCES CHEMICAL PRODUCTS DUTY

Amendments to the Australian Customs Tariff, which were introduced into the Commonwealth on November 17, are detailed in the December 15 issue of the Board of Trade Journal.

Chemical products affected include sulphuric ether, anaesthetic ether, n.e.i., and ether purifications, containing not more than 5 per cent. of proof spirit, on which the British preferential tariff per gallon is reduced from 6s. to 4s. 6d.; chloroform containing not more than 5 per cent. of proof spirit, on which a similar reduction is made; ethyl acetate, on which the ad valorem duty is reduced from 35 per cent. to 25 per cent.; amyl acetate, methyl salicylate, vanillin, coumarin, flavouring esters and aldehydes, not compounded, on which the ad valorem duty is reduced from 35 per cent. to 25 per cent.; French chalk and other preparations of steatite. N.e.i., on which the ad valorem duty has been reduced from 20 per cent. to 10 per cent.; casein, on which the ad valorem duty has been reduced from 35 per cent. to 20 per cent.; naphthalene (crude), on which the ad valorem duty has been reduced from 20 per cent. to 15 per cent.; naphthalene, n.e.i. on which the duty of 25 per cent. has been eliminated altogether; anhydrous and liquid ammonia, ammonium acetate, carbonate, and chloride, on which the ad valorem duty of 15 per cent. has been reduced to 12½; and toilet preparations (perfumed or not) n.e.i., on which the ad valorem duty has been reduced from 45 per cent. to 32½ per cent.

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curing of fish, the bread, bacon, butter and margarine industries, the canning industry, water softening and household purposes. As all these trades rely upon the chemical industry for other essentials of manufacture, it was a natural step by which Salt Union, Ltd., last year became one of the manufacturing groups of Imperial Chemical Industries, Ltd.

Mould Growth on Paint Films

Mechanism and Formation – Methods of Retardation

A PAPER on "Some Aspects of Mould Growth," by Mr. T. McLachlan and Mr. J. Floren, presented at a meeting of the London section of the Oil and Colour Chemists' Association, pointed out that mould growth on water paints had been the subject of investigations by various workers, but the present authors did not regard their recommendations as entirely solving the problem possibly because previous workers had not dealt with many of the principles which were now regarded as of fundamental importance.

In an endeavour to test the comparative value of various fungicides, water paints containing different fungicides were painted on blocks of wood which were then incubated in a moist atmosphere. The authors found, however, that the mould growth did not develop readily on the surfaces of the paints, even though these were repeatedly sprayed with mould spore emulsions, but that the moulds tended to develop on the unpainted edges of the wood and then to spread over the whole surface. It was considered probable, therefore, that much of the growth observed on the painted surfaces of buildings had growth through the paint film.

To test this hypothesis, plaster blocks were prepared and sterilised, treated with malt extract to provide a little food, inoculated with moulds from mouldy water paint and incubated to obtain a surface growth. On coating such blocks with water paint it was difficult to prevent the mould growth from penetrating the film of paint. It was also noticed that when these moulds were grown on a slightly alkaline plaster, the growth not only developed more rapidly than when grown on a slightly acid one but that the colour, after the first few days, changed from green to black. In view of this fact it was felt that much of the blackened film on buildings, usually attributed to soot, might consist in reality of a fungus growth.

It had been found that an antiseptic for use in paints should have a low solubility and be more or less non-volatile, and attention was drawn to organic mercury compounds, such as the naphthalate or the phenyloleate. It was also suggested that boric acid, by reason of its non-volatility and relatively low solubility, might prove beneficial in normal paints as well as, as is now known, being particularly useful in water paints. If fungicides were to prove of value, the author suggested that they would have to be mixed, since different organisms varied in their resistance to any one fungicide and a fungicide toxic to one type might even encourage the growth of another.

While zinc oxide tended to produce a hard film which resisted attack, its disadvantage was that the film was not sufficiently plastic. The probability was, said the authors, that search would have to be made for emulsifiers which were not readily attacked by moulds; sulphited lac and modern synthetic resins were mentioned in this connection. The disadvantage of some synthetic resins was that they tended to discolour very badly and were therefore not satisfactory for white paints. Bitumen had been used, but this also tended to discolour and had other disadvantages which would have to be overcome. It has been found that a paint incorporating linseed stand oil displayed a resistance to fungus penetration far superior to one incorporating either raw, refined or boiled linseed oil.

In order to produce a harder film, while still retaining plasticity, experiments were carried out on the addition of ordinary dammar and various synthetic resins, including chlorinated resins. It was thought that these latter would assist by acting as a fungicide, but, unfortunately, they appeared to give softer films, which were therefore penetrated quite easily. Some of the other synthetic resins made the film definitely more plastic but still hard, with resultant increased resistance to fungus attack. Their inclusion, however, would have to be made with care on account of the tendency to discolour.

Reference was made to bactericidal paints to which the

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French Petrol Production

New Plants to be Constructed

Among the decree laws recently passed in France, one authorising the National Liquid Fuel Office to work out a plan for petrol production is already bearing fruit. Permission has been given the Compagnie Français de Raffinage to construct a refinery of 70,000 tons per year capacity at Donges for the production of aviation spirit. The same company is also to build a petrol refinery plant at Martigues, with a capacity of 30,000 tons per year. This latter plant is to be so installed as to produce petrol by hydrogenation of coal, if required. A hydrogenation plant of 30,000 ton capacity is to be built at Decazeville, using the Bethune process. These three plants will be financed partly by private capital and partly by government subsidies. A fourth plant, entirely in private hands, is to be built at Pauillac. To help this plant to get into its stride, the Government will undertake to buy 100,000 tons of hydrogenation petrol per year for four years. This plant will use the process of the International Hydrogenation Patents group. At the end of the four-year period, the cost of construction of the plant would be amortised, and the petrol produced sold on the market normally.

THE PHOSPHATIDES OF THE SOYA BEAN

Some phases of original work on the phosphatides of the soya bean, which consist mainly of cephalins and lecithins, were revealed by Dr. A. A. Horvath, chemist at the University of Delaware, when he read a paper at the first meeting of the Biochemical Group of the Philadelphia Section of the American Chemical Society, held at the Franklin Institute recently. High yields of these phosphatides are obtainable by extraction with ethyl alcohol. Soya bean expeller meal yields at room temperature more phosphatides by extraction with chloroform than by ethyl alcohol. The ageing of the meal has a detrimental effect on the yield of phosphatides, and also induces a further splitting off of choline. It seems probable that cephalin is attached to the arginine of glycine, while the lecithin may form complex coacervations with arginine. One half of the arginine of glycine is very loosely bound to the glycine and may be readily split off by treatment with 0.01N sodium hydroxide. Studies are in progress on the effect of arginase on the arginine-phosphatide complexes of the soya bean.

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authors had given some little attention. So far as they could see, however, such paints containing a volatile germicide could have no future if they were to be employed in a dry atmosphere because bacteria could only be destroyed by the presence of an extremely toxic atmosphere at the surface of the paint. In this case, the germicide being volatile, the paint would obviously lose its bactericidal properties in a short time. In a damp atmosphere, where a thin film of moisture would tend to be present on the paint surface, the presence of a non-volatile fungicide of the organo-mercury type might prove of assistance.

In conclusion, the authors pointed out that the subject of mould growth on paint surfaces was similar to that on all other building materials, but with the difference that paints usually contained added food material to support fungal growth and might be capable of holding water more readily. Further, discoloration would tend to be more apparent. It was added that the growth of moulds on paints might be retarded in three ways:—(1) the under-surface to which the paint was to be applied should be dry; (2) fungicides added to the paints might exert a retarding influence on the growth of moulds through the paints; and (3) mould resistance of paints must be studied primarily from the point of view of obtaining films which were moisture-resistant, plastic and which at the same time did not provide food for mould growth.

Chemical Matters in Parliament

Power Alcohol

IN the House of Commons on December 15, Mr. Kelly asked the Chancellor of the Exchequer whether he could state the reasons for continuing the allowance of 5d. per proof gallon on the production of power alcohol from imported molasses; and whether any similar allowances were paid on the home production of petrol from imported crude oil.

Sir J. Simon stated in reply that the allowance in respect of power and industrial methylated spirits and of spirits used duty-free in arts and manufactures was paid because of the restrictions which in the interests of the Revenue the Excise law placed upon distillers. The answer to the second part of the question was in the negative.

Factory Fumes

In the House of Commons on December 15, Mr. Parker asked the Home Secretary whether any regulations had been made, and, if not, whether he intended to make any regulations, under Section 27 of the Factory Act, 1937, to deal with work to be done inside any chamber, tank, vat, or pit, in which dangerous fumes were liable to be present, and which involved risk to persons of being overcome thereby; and whether the Factory Department had made any regulations dealing with industrial alcohol factories.

Mr. Lloyd replied that the Home Secretary had no power to make regulations under the Section referred to which itself laid down detailed precautions for work of that kind. There was no special code of safety regulations for industrial alcohol factories.

Basic Slag Fertilisers

In the House of Commons on Monday, Rear-Admiral Beamish asked the Minister of Agriculture whether, as home-produced basic slag had not been sufficient to meet the requirements of farmers, he would provide explanatory figures and proposals for making up the shortage.

Mr. W. S. Morrison replied that the demand for basic slag had been greatly stimulated by the operation of the Land Fertility Scheme. During the period from September 6, 1937, to May 31, 1938, which period covered the greater part of the 1937-38 fertiliser season, applications for contributions under the Scheme were made in respect of 409,000 tons of basic slag. It was estimated that this quantity represented an increase of 70 per cent. over the preceding season. As regards supplies he referred the questioner to a reply he (the Minister) gave to a question on December 16. (This reply stated that the supply was entirely dependent upon the output of certain kinds of steel, and was not, therefore, a matter over which he (the Minister) had any control. He understood, however, that the steel output in October last showed an advance of 100,000 tons over that of the previous month and that there was a further increase in November. He was hopeful that with the reduction in price over a wide range of iron and steel products as from January 1 next, which had recently been announced, there would be a consequent increase in the supply of basic slag).

Mr. J. Morgan asked the Minister if he was considering replacing the deficiency that there apparently was in the supply of basic slag by other forms of home-produced fertilisers.

Mr. Morrison replied that if Mr. Morgan would indicate what home-produced fertilisers he had in mind he would consider the matter.

Industrial Alcohol

In the House of Commons on Wednesday, Capt. Euan Wallace (Financial Secretary to the Treasury) told Mr. Graham White that there were seven distilleries engaged solely in the production of industrial and power alcohol. All distilleries required the same Revenue supervision for the

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The Chemical Society

Nomination of President for 1939-1941—Awards of Longstaff Medal and Harrison Memorial Prize

AT a meeting of the Chemical Society at the Royal Institution on December 15, the President, Professor F. G. Donnan in the chair, it was announced that Professor Robert Robinson, F.R.S., Waynflete Professor of Chemistry at Oxford University, had accepted nomination to the office of President for the period 1939-1941.

It was also announced that the Longstaff Medal for 1939 had been awarded to Professor I. M. Heilbron, D.S.O., F.R.S., for his outstanding contribution to the science of chemistry in the field of natural products, especially vitamin A and related natural pigments, the anterachitic vitamin D and its precursors, and the constituents of the fish liver oils and of natural resins of the triterpene group. Professor Heilbron was educated at the High School, Glasgow, and received his chemical training at the Royal Technical College, Glasgow, and at Leipzig University. He was lecturer in organic chemistry at the Royal Technical College, Glasgow, from 1909 to 1914, and in 1919 became Professor of Organic Chemistry there. In 1920, he proceeded to Liverpool University as Professor of Organic Chemistry, and in 1933 held the Chair of Organic Chemistry at Manchester University, where he was also Director of the Chemical Laboratories. In 1938, he received the appointment of Professor of Organic Chemistry at Imperial College, London.

Prize Committee's Unanimous Decision

It was further announced that the Harrison Memorial Prize Selection Committee, consisting of the Presidents of the Chemical Society, the Institute of Chemistry, the Society of Chemical Industry, and the Pharmaceutical Society had unanimously decided that the Harrison Memorial Prize for 1938 should be awarded to Mr. Alexander King. The presentation of the prize will be made at the annual meeting of the Chemical Society to be held at Burlington House, London, on March 30, 1939. Mr. King received his chemical training at the Imperial College, South Kensington, graduating as B.Sc. in 1929 and as M.Sc. in 1931. From 1930 to 1931, he worked in the Physical Chemistry Institute of the University of Munich under Professor K. Fajans, and from 1931 to the present date has held the post of assistant lecturer at Imperial College. He also acts as chief consultant to Universal Emulsifiers, Ltd., being in charge of technical research. The Leverhulme Fellowship was granted to him in the summer of 1938 as leader of a scientific expedition from Imperial College to Jan Mayen in the Greenland Sea. His original investigations on adsorption and on emulsions and other colloid topics form notable contributions to our knowledge of physical chemistry.

After a brief statement regarding the establishment of the Faraday Lectureship, the President introduced Dr. Irving Langmuir, associate director of the Research Laboratory of the G.E.C., Schenectady, who delivered the seventeenth Faraday Lecture entitled "Monolayers on Solids." At the conclusion of the lecture the President presented the Faraday Medal to Dr. Langmuir, and proposed a vote of thanks, which was seconded by Professor E. K. Rideal, F.R.S.

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same purpose—that is, to ensure that a product which, whatever its intended use, was a potable intoxicant did not enter into consumption as a beverage unless the spirit duty was paid on it. Capt. Wallace further informed the same member that the allowance of 8¾d. per gallon on industrial and power alcohol produced in the distilleries which do not make potable alcohol was estimated to cost the Revenue £850,000. It was not proposed, he added, to abolish this allowance.

British Overseas Chemical Trade in November

ACCORDING to the Board of Trade returns for the month ended November 30, 1938, imports of chemicals, drugs, dyes and colours were valued at £1,213,381 as compared with £1,333,628 for November, 1937, a decrease of £120,247. Exports were valued at £2,021,834 as compared with £2,084,524, a decrease of £62,690. Re-exports were valued at £36,560.

Imports

	Quantities. November 30, 1937.	Quantities. November 30, 1938.	Value. November 30, 1937. £	Value. November 30, 1938. £
Acids—				
Acetic .. .. cwt.	16,897	14,817	19,452	19,912
Boric (boracic) .. ,,	7,096	2,570	7,689	2,873
Citric .. .. ,,	901	2,047	3,577	8,437
Tartaric .. ,,	837	1,347	3,782	6,325
All other sorts .. value	—	—	9,812	4,944
Borax .. .. cwt.	17,472	12,407	12,101	8,180
Calcium carbide .. ,,	125,903	101,662	66,293	47,064
Fertilisers, manufactured—				
Superphosphate of lime tons	605	2,418	1,460	4,942
All other descriptions ,,	3,029	2,397	19,548	14,360
Potassium compounds—				
Caustic and lyes cwt.	6,567	11,064	7,682	12,962
Chloride (muriate) ,,	155,992	185,122	53,912	54,255
Kainite and other potassium fertiliser salts cwt.	186,775	126,379	35,823	23,540
Nitrate (saltpetre) ,,	4,888	10,266	3,589	7,368
Sulphate .. ,,	114,766	55,930	53,120	25,873
All other compounds ,,	7,824	12,228	9,963	17,125
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	226	565	112	594
Chromate and bichromate .. .. cwt.	4,632	898	5,022	1,174
Cyanide .. .. ,,	187	2,213	555	4,810
Nitrate .. .. ,,	80,120	30,325	18,287	7,468
All other compounds ,,	21,760	15,988	26,102	12,523
Chemical manufactures value	—	—	338,263	331,400

	Quantities. November 30, 1937.	Quantities. November 30, 1938.	Value. November 30, 1937. £	Value. November 30, 1938. £
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	126,747	141,500	10,639	11,407
Medicinal oils .. cwt.	3,265	4,309	8,950	10,592
Proprietary medicines value	—	—	145,177	74,875
All other sorts .. ,,	—	—	69,892	54,209
Finished dye-stuffs obtained from coal tar cwt.	4,817	4,708	144,796	154,649
Extracts for dyeing ,,	4,290	3,754	7,871	6,565
Extracts for tanning (solid or liquid)—				
Chestnut .. cwt.	17,272	30,671	12,956	22,892
Quebracho .. ,,	14,627	37,880	14,166	34,989
All other sorts .. ,,	45,433	54,845	36,928	49,407
All other dyes and dye-stuffs .. .. cwt.	956	849	23,948	16,638
Painters' and printers' colours and materials—				
White lead (basic carbonate) .. cwt.	7,698	5,530	11,591	7,162
Lithopone .. ,,	22,911	13,677	14,410	8,876
Ochres and earth colours cwt.	30,477	30,066	9,946	10,703
Bronze powders and other metallic pigments .. cwt.	2,033	1,907	16,847	14,91.
Carbon blacks .. ,,	46,663	61,027	65,560	82,19.
Other pigments and extenders, dry .. cwt.	34,028	41,148	7,779	8,921
All other descriptions ,,	16,142	13,362	36,028	28,265
Total .. .. value	—	—	1,333,628	1,213,381

Exports

Acids—				
Citric .. .. cwt.	2,906	2,616	14,054	12,130
All other sorts .. value	—	—	28,329	23,701
Aluminium compounds tons	5,740	2,494	54,562	21,966
Ammonium compounds—				
Sulphate .. tons	23,858	27,581	150,219	179,704
All other sorts .. ,,	1,912	1,903	24,395	18,858
Bleaching materials—				
Bleaching powder (chloride of lime) .. cwt.	77,111	46,020	18,710	13,575
All other sorts ,,	8,948	8,089	20,607	20,385
Coal tar products—				
Cresylic acid .. galls.	181,097	223,233	35,254	24,247
Tar oil, creosote oil, galls.	5,016,668	2,473,526	129,385	6,718
All other sorts .. value	—	—	23,287	13,445
Copper, sulphate of tons	1,958	599	36,090	10,579
Disinfectants, insecticides, etc. .. .. cwt.	29,259	43,409	61,124	86,194
Fertilisers, manufactured tons	19,677	15,498	53,136	79,952
Glycerine .. .. cwt.	11,366	12,637	45,406	41,882
Lead compounds .. ,,	16,567	11,337	24,979	16,635
Magnesium compounds tons	495	590	12,186	13,870
Potassium compounds cwt.	3,681	2,640	10,300	10,342
Salt (sodium chloride) tons	18,594	20,803	52,129	59,806
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	337,753	374,707	72,583	82,185
Caustic .. .. ,,	160,901	212,937	84,144	113,135
Nitrate .. .. ,,	86	8,895	65	3,086
Sulphate, including salt-cake .. .. cwt.	50,548	66,719	6,016	7,526
All other sorts .. ,,	75,906	70,980	85,514	64,934
Chemical manufactures and products .. value	—	—	28,000	23,255
Drugs, medicines and medicinal preparations cwt.	—	—	14,023	10,191

Zinc oxide .. tons	1,428	1,503	33,182	26,518
All other descriptions value	—	—	237,058	236,904
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	145,586	221,452	15,988	23,890
Proprietary medicines value	—	—	111,916	98,203
All other descriptions value	—	—	151,446	176,310
Dyes and dye-stuffs and extracts for dyeing and tanning—				
Finished dye-stuffs obtained from coal tar—				
Alizarine, alizarine red and indigo (synthetic) cwt.	1,780	756	13,657	6,487
Other sorts .. ,,	6,357	6,656	97,279	104,799
Extracts for tanning (solid or liquid) cwt.	25,348	17,382	22,986	16,689
All other descriptions ,,	2,100	1,876	11,788	10,745
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	11,459	10,104	10,995	10,622
Other descriptions ,,	41,526	34,616	49,812	52,658
White lead .. ,,	3,202	4,760	7,107	9,529
Ships' bottom compositions cwt.	2,646	3,216	9,851	11,979
Paints and painters' enamels cwt.	43,607	44,129	126,318	121,835
Varnish and lacquer (clear) .. galls.	58,762	71,183	23,891	28,795
Printers' ink .. cwt.	4,358	3,677	26,007	20,860
All other descriptions ,,	44,082	46,055	92,769	90,156
Total .. .. value	—	—	2,084,524	2,021,834

Re-Exports

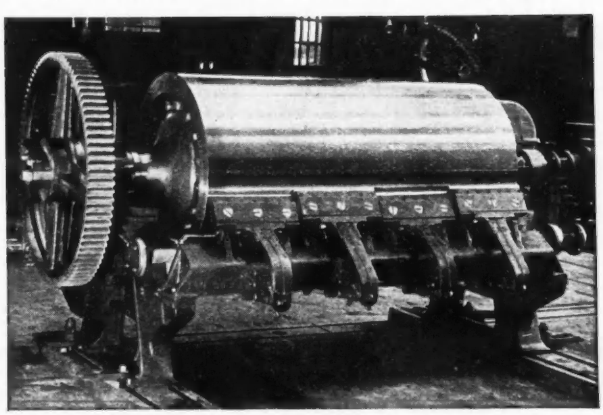
Dyes and dye-stuffs and extracts for dyeing and tanning .. .. cwt.	1,656	426	2,453	1,726
Painters' and printers' colours and materials cwt.	1,167	759	1,031	1,388
Total .. .. value	—	—	45,507	36,560

Nickel Cast Irons

Interesting Applications in Chemical Equipment

FROM the earliest days of chemical engineering cast iron has been one of the principal materials used for the construction of plant and equipment. The modern demand for greater efficiency in engineering practice has however emphasised the limitations of ordinary cast iron and in recent years attention has been given to the development of special types of cast iron with improved properties. An important group of alloys generally containing nickel is of particular interest to the chemical industry and useful information on these alloys is given in a publication entitled "Nickel Cast Iron in Chemical Equipment" recently issued by the Bureau of Information on Nickel, The Mond Nickel Co., Ltd.

The author opens with a discussion of the various properties required and these generally include a combination of the following: density, pressure tightness, machinability, high strength, hardness, wearing quality, heat resistance and corrosion resistance. The first four properties are associated with the production of modern high-duty iron castings and the



Drying machine for use in chemical works. A 2.0 per cent. nickel cast iron was used for the cylinder to ensure a high degree of finish together with good weaving quality.

availability of these castings with improved density, pressure tightness, etc., depends on improved foundry technique, control over composition of the base iron and the judicious use of alloy additions. Many of these irons have improved strength and, whereas in general engineering castings strengths of 12-14 tons per sq. in. were common only a few years ago, to-day castings of all types can be produced ranging from 17-20 tons per sq. in. Where increased pressure or other conditions demand even stronger materials, some of the new special high-duty cast irons become of interest, while other qualities, particularly resistance to heat and corrosion, may now be obtained in special types of alloy cast iron which have been developed in recent years.

Where outstanding properties are not required, but something rather better than ordinary cast iron is needed, the author recommends a modern high-duty alloy cast iron of the nickel or nickel-chromium type containing 1-2 per cent. of nickel. These alloys are of special value for such components as machine frames, drier drums, pump parts, filter-press parts and so on. It is now well established that one of the principal influences of nickel in high-quality castings is to ensure uniformity of structure with freedom from local unsoundness, and these features make the nickel alloy cast irons of increasing use to the chemical industry. The economies effected in the case of caustic pots, for example, are said to be outstanding, while in the case of castings subjected to pressure, such as pumps, valves, fittings, etc., the use of the alloy addition is fully justified by the increased reliability of the casting. The improvement in machinability is another factor that should not be overlooked.

(*Continued at foot of next column.*)

Malonic Ester for Veronal Manufacture

A New Method of Preparation from Calcium Malonate

A NEW method of preparing malonic ester from calcium malonate, for ultimate use in the manufacture of veronal, has recently been in use in China. The process was originally worked out by C. H. Kao and K. H. Chen, of the Department of Chemistry, National Tsing Hua University. The new method is claimed to give a yield higher than hitherto obtained by any other method recorded.

The calcium malonate is dried and ground to a fine powder and suspended in 95 per cent. ethyl alcohol (1 c.c. per 5 grams), where it is treated with a current of hydrogen chloride. Benzene, or alternatively carbon tetrachloride, to the extent of 1 c.c. per 1 gram of calcium malonate originally used, is added and the mixture is refluxed for three hours. On cooling the benzene (or carbon tetrachloride), ester separates out, and is washed once with a saturated solution of common salt, a 10 per cent. solution of sodium carbonate, and water, in turn. The benzene (or carbon tetrachloride) is then removed by distillation on a water bath, and the ester remaining is purified by distillation under reduced pressure. The yield of pure malonic ester is about 70 per cent. of that theoretically possible, *i.e.*, 590 grams of malonic ester can be obtained from 760 grams of calcium malonate. For veronal manufacture the malonic ester is converted into the diethyl ester, which is reacted with carbamide (urea).

INCREASE IN INDIA'S MINERAL WEALTH

The Geological Survey of India reports an increase of Rs. 5 crores 69 lakhs or 36.1 per cent. in the value of minerals produced in India in 1937 over the 1936 output, the total value for 1937 being Rs. 21 crores 43 lakhs. Coal remained at the head of the list with a value of Rs. 7 crores 81 lakhs, but manganese displaced gold in the second place with a value of Rs. 4 crores 52 lakhs, as against Rs. 3 crores 4 lakhs for gold. Gold was in fact the only important mineral the output of which decreased in value, but the decrease was only by the trifling amount of 0.3 per cent. Spectacular increases have taken place in the production values of what may be termed the industrial minerals. Given in percentages, these are: ilemnite 35.7, chromite 38.2, refractories 87.8, magnesite 60.4, barytes 830.6, monazite 30.0, gypsum 20.5, fuller's earth 4.7, bauxite 748.6, graphite 270.4, asbestos 93.6 and apatite 26.3.

(*Continued from previous column.*)

Where the problem of wear is serious, the low alloy nickel-chromium cast irons have shown impressive results, while in cases where the maximum possible hardness and wearing quality are required, such as in some of the crushers for paints and chemicals, generally the special white iron known as Ni-Hard is of interest. In pumps and other parts of equipment handling liquors, the question of combined abrasion or wear-resistance with corrosion-resistance frequently arises. In this class of application the combination of abrasion resistance of the special high alloy cast iron known as Ni-Resist, with its resistance to corrosive contact is of particular importance.

In many parts of chemical equipment the question of heat resistance is also important and the more highly alloyed types of iron known as Ni-Resist and Nicrosilal are of special value since they have a high degree of resistance to corrosive attack. Ni-Resist is essentially a cast iron alloyed with about 14 per cent. of nickel, 6 per cent. of copper and 2 per cent. of chromium. It should be noted, however, that the composition can be frequently modified to suit particular conditions of service. Nicrosilal is characterised essentially by an abnormally high silicon content, this element being as much as 4.5 per cent. The structure of the metal is rendered austenitic by the inclusion of about 18 per cent. of nickel, while a further addition of up to 2 per cent. of chromium is usually made.

New Copal Derivatives

Possessing Properties Suitable for Plasticisers

TWO new derivatives of Congo copal are described by Hellinckx (*Paint Technology*, 1938, *3*, 369, 375). The ordinary "ester copals" are obtained by esterifying the carboxylic groups in the resin acids by means of alkylating agents. The new derivatives may be described as "copal ethers," since they are produced by introducing acyl groups into the OS groups of the hydroxy acids in the resin.

Thus acetocopal is made by heating together at 100° C. for 5 hours, 20 parts of copal, finely ground, 10 parts of acetic acid (glacial), and one part of acetic anhydride. At the end of this time the liquors are decanted from the residue of unchanged resin, and diluted with ten volumes of water, whereby the acetocopal is precipitated. It is washed with very dilute hot alkali, and then with water. The separation from excess acid may also be accomplished by distillation under reduced pressure. The residue, which consists of 50 per cent. of the weight of the initial material, can be re-used after washing in acetic acid.

Flexibility and Elasticity

The product is of resinous appearance, varying in colour from pale yellow to deep brown according to the source of the resin. It has the following physical constants: melting point 60° C., softening point 35° C., density 1.04 at 20° C., refractive index 1.53, acid value 121. It is very soluble in benzene, toluene, acetone, ethyl, butyl, and amyl acetates, and also in tricresyl phosphate. It is fairly soluble in alcohol, carbon tetrachloride, and ethylbenzene, and only slightly soluble in ether and benzine. The outstanding properties, mechanically, are its flexibility, plasticity, and elasticity, and excellent adhesion on almost any ground.

Butyrocopal can be prepared similarly by heating together ten parts of copal with five parts of butyric acid. The excess acid is removed by reduced pressure distillation. The mixture yields about 11 parts of copal ether, which contains, however, the unchanged resin. The product has a similar appearance to acetocopal, but is harder and less fusible. Its melting point is 118° C., and the softening point 70° C.; density 1.03 at 20°, acid value 139. It is very soluble in ether, butyl and amyl alcohols, methyl acetate, trichlorethylene, and tricresyl phosphate; less soluble in alcohol, ethyl acetate and chloroform; and only slightly in methyl alcohol, benzine, carbon disulphide, and carbon tetrachloride. The properties are similar to acetocopal, the elasticity being particularly high. Both derivatives should find a market as plasticising agents for cellulose lacquers.

WITH THE COMPLIMENTS OF THE SEASON

We have much pleasure in acknowledging the receipt of a number of Christmas and New Year cards, calendars and diaries which have been kindly sent by subscribers and advertisers. Among them the London Shellac Research Bureau have sent an attractive card which contains a photograph of one of the 29 cave-temples and monasteries excavated in the face of a 250 feet high rock in Hyderabad State, India. An old print of a race meeting in progress in 1832 on the site of the Teesdale works of Head, Wrightson and Co., Ltd., is contained in the card sent by the company. A reproduction of a crayon drawing of a scene in Crete forms the cover of the card sent by Dr. and Mrs. Felix Singer, while the cover of the card issued by the Adelaide Chemical and Fertiliser Co. is a magnificent illustration in colour of Westminster Abbey.

As in previous years a useful vest-pocket diary has been sent by the Staveley Coal and Iron Co., Ltd. Wall calendars have been sent by Crofts (Engineers), Ltd., and Robey and Co., Ltd., Lincoln. Venesta, Ltd., sent a refill for a desk diary with samples of Venesta metal foils inserted, and James Storey and Co., Ltd., sent an unusual but highly practical souvenir in the form of a clothes brush.

Recent Trade Literature

A pattern card dealing with Naphthalene Straw Navy Blue DGS, an acid dyestuff specially designed for application to straw—a new addition to the I.C.I. range—has just been issued by the company. Naphthalene Straw Navy Blue DGS is distinguished by its solid dyeing properties on split and mottled straws. It is practically unaffected by hard water and does not break down or change its shade on prolonged boiling. Dyeing is carried out at the boil, with the addition of 3-5 per cent. of tartaric acid or acetic acid (30 per cent.) to the dyebath after boiling for 1 hour.

"Robroy" brand non-combine British white lead is a new product manufactured by Robinson Brothers, Ltd., and distributed by SIR S. W. ROYSE AND CO., LTD. The latter have issued a booklet introducing the material to consumers. The booklet quotes extracts from a report by Mr. J. Cruickshank Smith, B.Sc., F.I.C., M.I.Chem.E., on the results of the exhaustive tests to which he subject the lead. His report shows that "Robroy" white lead conforms to British Standard Specification, and possesses all those properties usually associated with white lead of the highest grade as well as features of a distinctive and attractive character.

Entitled "Modern Thermometry," the BRITISH ROTOTHERM CO., LTD., have issued a 28-page catalogue illustrating and describing various models in their range of products. Engineers are agreed that the correct and economical operation of plant is greatly encouraged by placing clear-reading temperature gauges at important points in the plant where they are in full view of the operator. It is claimed that the robust construction of the Rototherm generally enables the gauge to be mounted direct at the spot where temperature indication is required. Standard Rototherm temperature gauges are guaranteed to sustain in operation an accuracy within 1 per cent. of the total scale value by which they are calibrated. This degree of accuracy is more than sufficient for normal commercial and industrial purposes; for laboratory use, however, Rototherm gauges can be supplied having an accuracy within 0.5 per cent.

The Scalebuoy system for preventing and eliminating scale and corrosion is described in a leaflet issued by SCALEBUOYS, LTD. The essential feature of Scalebuoys is an hermetically sealed glass bulb of special type filled with inert gases and containing a small mercury pool. Two or more Scalebuoys, according to the size of the hot water system, are placed in the cistern. The movement of the Scalebuoys caused by the inflow of water from the mains, produces intermittent electrical discharges which act upon the scale-forming mineral salts in solution in the water. When the water is heated these electrically-induced effects persist, with the eventual result that the scale crystals do not adhere to the walls of boiler or pipes. They are instead precipitated as a soft sediment or sludge, which can easily be removed. The leaflet emphasises the value of Scalebuoys to industrial concerns heating thousands of gallons of water a day in the boilers of their factories.

The Towers Messenger, published by J. W. TOWERS AND CO., LTD., refers to two new self-contained models of the Towers ultra-violet lamp for fluorescence analysis, which the company have recently introduced. The standard model is an improved pattern of the lamp introduced earlier this year, which it replaces. It incorporates a high pressure mercury discharge lamp with the necessary electrical control gear, and a filter for cutting off all visible light. The source of radiation is a high pressure mercury discharge tube of quartz, which is enclosed in an outer protective bulb of special black glass which transmits freely rays of 365 mm. wavelength. The junior model is fitted with the same type of high pressure mercury discharge lamp as the larger model, but of a smaller size. The total consumption of the lamp is 87 watts. *The Towers Messenger* also gives details of Towers automatic water stills of stainless steel or copper for heating by steam, gas or electricity, the Carter-Simon rapid moisture tester, the rotary blower and vacuum pump and non-drip bottles.

Personal Notes

MR. F. HECTOR WALL, outside technical representative of the Clayton Airline Co., Ltd., has been transferred to the Leicester branch of the company.

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MR. J. G. GOODENOUGH has resigned his position as a director and general manager of Dorman, Long and Co., Ltd. He was appointed general manager and elected a director in 1937, and previous to that was, for two years, assistant to the managing director.

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MR. A. L. MATTHISON, managing director of Arthur Holden and Sons, Ltd., varnish and enamel manufacturers, Birmingham, has written a novel at the age of 70. It is a thriller called "Death in the Cemetery," in which the hero, aptly enough, is a "traveller in varnish."

Lieut.-Colonel J. H. M. Greenly, C.B.E., president of the Institute of Fuel, who has accepted the Prime Minister's invitation to serve on the new industrial advisory panel on re-armament for purposes of liaison with the Air Ministry Panel of which he is a member.

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MESSRS. W. A. AKERS, F. W. BAIN, W. F. LUTYENS, A. J. QUIG, AND F. WALKER, of Imperial Chemical Industries, Ltd., have been appointed executive managers of the company. Though they will not have formal status as members of the management board, they will attend the board meetings.

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MR. ERNEST R. CANNING (the Deputy Mayor of Birmingham), head of W. Canning and Co., makers of chemicals, plating and polishing materials, and Mrs. Canning, were honoured by the members of the Birmingham City Council last week when they received presentations in recognition of their efficient services as Lord Mayor and Lady Mayoress last year.

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DR. WALTER S. LANDIS will be presented with the Perkin Medal of the Society of Chemical Industry at a joint meeting of the American Section of the Society of Chemical Industry and the American Chemical Society on January 6, 1939. The medal is awarded annually for the most valuable work in applied chemistry and is given to Dr. Landis for his work on cyanamid, derivatives of cyanamid, fertilisers (ammonium phosphate in particular), the first commercial production of argon and contributions to the explosive industry. Mr. Victor G. Bartram, president of the Society, will preside over the meeting.

MR. WILLIAM COOPER, B.Sc., has been appointed chief chemist at the British Aluminium Co.'s new works at Newport, Monmouthshire.

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MR. LEONARD A. BAILEY, Ph.C., has joined the representative staff of The British Drug Houses, Ltd. He will call upon wholesalers, manufacturers, and some of the London hospitals.

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PROFESSOR F. M. ROWE, of Leeds, addressed the Nottingham branch of the Society of Dyers and Colourists on "The Life and Work of Sir William Henry Perkin," at Nottingham University last week.

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SIR ROBERT PICKARD, president of the Institute of Chemistry and Vice-Chancellor of London University, proposed the toast of "Medicine and Law" at the annual dinner of the Medico-Legal Society on December 16.

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SIR PHILIP DAWSON, M.P., chairman of the Williamson Manufacturing Co. and president of the Institute of Fuel, who died on September 24 last, left estate valued at £22,848 (net personalty £17,703).

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DR. JOSEPH WILLIAM MELLOR, C.B.E., D.Sc., F.R.S., formerly director of the British Refractories Research Association, who died in June last, left estate valued at £14,689 (net personalty £13,544).

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PROFESSOR ALFRED W. NASH, head of the Department of Oil Engineering and Refining at Birmingham University, has gone on a tour of the Anglo-Iranian oil fields to study the latest practice in means of production and refining.

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MR. OSWALD GUNNELL has been appointed chairman of J. Pullar and Sons, Ltd., cleaners and dyers, in place of Mr. H. D. Drysdale, who has had to retire owing to ill-health. Mr. Gunnell is chairman and managing director of Johnson Bros. (Dyers), Ltd., Bootle, Liverpool, having succeeded the late Sir Benjamin Sands Johnson in January last.

OBITUARY

MR. SAMUEL MARKS, late of Marks and Johnston, Anchor Oil Works, Glasgow, died on December 16 at the age of 74.

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MR. JOHN S. BAUCHOP, a director of the United Turkey Red Co., Ltd., with which he had been connected for many years, has died at the age of 61.

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MR. JOSEPH JAMES GITTINGS, J.P., managing director of Gittings, Hill and Boothby, varnish manufacturers, Long Acre, Birmingham, died recently.

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MR. HARRY SILVESTER, B.Sc., F.I.C. has died. He was keenly interested in the work of the Society of Chemical Industry, and was one of the founders of the Birmingham and Midland Section of the Society, acting as chairman from 1907 to 1909. For many years he was borough analyst at West Bromwich, retiring in 1937.

TO-DAY'S ANNIVERSARY

JAMES PRESCOTT JOULE, born on December 24, 1818, a brewer by trade and also an amateur scientist, was the first person to calculate the mean velocity of motion for the molecules of a gas. He did this in 1851—when following the work of Avogadro, who put forward the hypothesis that particles of a gas are in constant motion, moving with great velocity in straight lines, and ever colliding with one another and striking the walls of the containing vessel. This appears to have been originally suggested by Robert Hook in 1678, was adopted by Daniel Bernoulli in 1738. The hypothesis was eventually developed in greater detail by two German physicists, Kronig and Clausius, and by the English physicist Maxwell.

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General News——From Week to Week

THE ITALIAN GOVERNMENT HAS PUBLISHED A DECREE providing that 8,210 metric tons of calcium cyanamide may be imported free of duty prior to March 31, 1939.

W. J. BUSH AND CO., LTD., Ash Grove, Hackney, E.8, announce that they will be closed for the receipt of goods until January 1, owing to the Xmas holidays and stocktaking.

H.M. CONSUL AT CARACAS, reports that a resolution of the Ministry of Finance provides for the free entry into Venezuela of sulphate of potassium which is now classified under articles for agricultural purposes in the Venezuelan Customs Tariffs.

THE FOOD GROUP OF THE SOCIETY OF CHEMICAL INDUSTRY has formed a Nutrition panel with Professor J. C. Drummond, professor of Biochemistry at London University, as chairman, and Mr. A. L. Bacharach as honorary secretary. The scope of the panel will include the production, processing and distribution of food for both human and animal consumption, and the manufacture and control of preparations for supplementing diets for medical use in the nutritional disorders.

TO IMPLEMENT THE TRADE AGREEMENT between Britain and the U.S., the Treasury have issued the following orders: Additional Import Duties (No. 9) Order, 1938; Silk Duties Order, 1938; Import Duties (General) Ad Valorem Import Duties (U.S. Agreement) Order, 1938; Import Duties (Exemption) (U.S. Agreement) Order, 1938; and Ottawa Agreements Order, 1938. Except the Additional Import Duties (N. 9) Order, which does not involve any alteration in rates of duty, the orders will operate as from January 1, 1939.

AFTER AGREEMENT BY ALL THE AUTHORITIES CONCERNED the new Imperial Bureau of Dairy Science has now been established at Shinfield, near Reading. Professor H. D. Kay, director of the National Institute for Research in Dairying, has been appointed director of the bureau, and Mr. W. G. Sutton, from Massey Agricultural College, New Zealand, has been appointed deputy-director. The bureau is financed co-operatively by the Governments of the British Empire in the same way as the other Imperial agricultural bureaux.

THE CHINA CLAY INDUSTRY seems to be recovering from the slump which set in at the beginning of the year and continued to almost the end of the summer. The total deliveries for nine months to September, 1938, were 510,315 tons, which, when compared with 711,763 tons for the corresponding period in 1937, reveal a very serious set-back in trade, but the shipping for the past three months show that business is again improving. The shipment made in November were as follows: Fowey, 43,091 tons of china clay, 1,322 tons of china stone, 1,742 tons of ball clay; Par, 13,159 tons of china clay, 802 tons of china stone; Charlestown, 3,790 tons of china clay, 360 tons of china stone; Padstow, 732 tons of china clay; Plymouth, 259 tons of china clay; by rail, 4,350 tons of china clay. The aggregate was 69,607 tons against 70,597 tons in October and 76,288 tons in September.

MAKING FACTORY EMPLOYEES MORE AWARE OF THEIR RESPONSIBILITIES under the new Factories Act is the purpose of two posters recently issued by the National "Safety First" Association as part of the service offered jointly by that body and the Industrial Welfare Society. The first draws the attention of employees to their duties under Section 119 of the Act, which requires them to make proper use of the safety and health appliances provided by law and which makes it an offence for them to do wilfully or without reasonable cause anything liable to endanger themselves or others. The second deals with operations at unfenced machinery. The posters are double-crown size (30 inches by 20 inches) and are attractively printed in clear and well arranged type. They are obtainable from the National "Safety First" Association (Inc.), 52 Grosvenor Gardens, London, S.W.1. The price is 1s. each, but reduced prices are available for those requiring quantities.

ATTENTION IS DRAWN TO THE POISONS (AMENDMENT) RULES, 1938 (S.R. and O., 1938 No. 1548) and the Poisons List (Amendment) Order, 1938 (S.R. and O. 1938 No. 1547) which were made by the Secretary of State on December 15, 1938, and will come into operation on January 1, 1939. Rule 17 has been re-enacted with amendments to permit certain new methods of labelling. Benzedrine and related substances (except when contained in inhalers) are included in Part I of the Poisons List and also in the First Schedule and paragraph 1 of the Seventh Schedule to the Poisons Rules. Sulphanilamide and related substances are included in Part I of the Poisons List and also in the First and Fourth Schedules to the Poisons Rules. Amendments made in the Fifth Schedule to the Rules permit listed sellers to sell ointments containing nitrobenzene for the treatment of animals, and photographic solutions or materials containing metallic oxalates (other than potassium quadroxalate). Copies of the Order (price 1d. net) and Rules (price 2d. net) may be purchased from H.M. Stationery Office.

SHOTTS IRON CO., LTD., have damped down two blast-furnaces at the Shotts Iron Works for an indefinite period. About 300 men will be temporarily unemployed.

THE BRITISH ALUMINIUM CO., LTD., has acquired the Whinnyhall Estate, Burntisland, formerly the site (about 200-300 acres in extent) of the Binnend Works, belonging to the Burntisland Oil Co.

THE KESTNER EVAPORATOR AND ENGINEERING CO., LTD., have been awarded the contract for acid melting plant for the Royal Ordinance Factory by H.M. Office of Works. The plant embodies the Merilene system of fluid heat transmission.

THE REPORT OF THE SCOTTISH CO-OPERATIVE WHOLESALE SOCIETY for the past year shows an increase in production at the chemical sundries factory of 83 tons, equal to £30,334, compared with 1937. At the Society's soap works production has increased by over 220 tons during the same period.

THE LONDON IRON AND STEEL EXCHANGE is to wind up at the end of this year. Explaining this decision, the weekly report of the Exchange says: "For some time it has been apparent that owing to the changes in trading consequent upon the reorganisation of the iron and steel industry, the Exchange could no longer fulfil many of the functions for the performance of which it was established."

THE SECRETARY FOR MINES has renewed for a further twelve months the prospecting licences granted to the D'Arcy Exploration Co., in respect of 177 square miles in Dorset, Wilts and Hants, and 71 square miles of Midlothian and East Lothian in Scotland. The company has abandoned two other licences covering contiguous areas in Sussex, extending roughly from Pulborough and Arundel eastwards to Bexhill and Pevensey.

MEMBERS OF THE PORTSMOUTH AND DISTRICT CHEMICAL SOCIETY under the chairmanship of Mr. F. G. Edmed, F.I.C., were given a lecture on vegetable drugs, by Mr. F. Hemming, at their recent meeting. The speaker described the methods of commercial adulteration of the more costly drugs and detailed the percentages which may be extracted according to the climate or altitude conditions of growth in the parent plants.

THIRTY-FIVE RAILWAYMEN WERE GASSED in the L.M.S. Railway goods shed at Crewe, on December 15. A cylinder of chloride gas, which was believed to be empty, was in transit with others from Rugby to the I.C.I. works at Runcorn, and while in the shed fumes were seen to come from it. Within a minute all the men in the shed were overcome. Thirty of the men were allowed to go home after treatment and five were detained.

THE L.C.C. IS PROMOTING A BILL, which will come before the present session of Parliament, for the purpose of obtaining powers to levy rates upon site values. This proposal, in the view of the Federation of British Industries, contains serious objections from the point of view of industrialists and, accordingly, the Executive Committee of the Federation has passed a resolution, in which it states the grounds on which industry is opposed to the Bill.

MR. H. ICKES, U.S. SECRETARY OF THE INTERIOR, originally refused to supply Germany with the helium required for her new airship, on the ground that he was not satisfied that the helium would not be used for belligerent purposes. However, in his recent annual report to President Roosevelt, he emphasises that the U.S. Government's helium plant at Amarillo produces "only about one-third the quantity which a foreign nation desired" (presumably Germany).

THE IMPORT DUTIES ADVISORY COMMITTEE give notice of the following applications: For the addition to the Free List of Ouricury wax and alloys of metal, unwrought, in blocks, ingots, cakes, bars and slabs, containing more than 50 per cent. by weight of bismuth and more than 15 per cent. by weight of lead. Any representations which interested parties may desire to make in regard to these applications should be addressed in writing to The Secretary, Import Duties Advisory Committee, Shell-Mex House, Strand, London, W.C.2, not later than January 14, 1939.

PARTICULARS OF THE CHANGES in the French Customs duties on various articles including large numbers of animal and vegetable oils, soap, lime and dyestuffs made by two decrees on November 30 are published in the *Board of Trade Journal* of December 15 ("minimum" tariff rates only are quoted). The same issue of the *Board of Trade Journal* contains details of modifications to the Sierra Leone Customs Tariff including a reduction of from 10 per cent. to 8 per cent. in the British preferential tariff on spirituous drugs and medicinal preparations (ad valorem), and a reduction of from 10 per cent. to 8 per cent. in the British preferential tariff on other spirituous drugs and medicinal preparations containing not more than 20 per cent. by weight of pure alcohol (ad valorem.)

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

DESULPHURISATION OF SULPHIDE ORES.—C. A. Bolton. 35705.

MANUFACTURE OF PIGMENTED COATING COMPOSITIONS.—H. M. Bunbury, A. A. Harrison, H. A. Thomas, and Imperial Chemical Industries, Ltd. 35551.

PROCESS FOR THE FINISHING OF CELLULOSIC MATERIALS.—Calico Printers' Association, Ltd., L. A. Lantz, and W. S. Miller. 35661.

PLASTIC COMPOSITIONS.—Carbide and Carbon Chemicals Corporation. (United States, Dec. 29, '37.) 35461.

PLASTIC SELF-HARDENING COMPOSITIONS.—J. H. Carrington, F. S. Roberts, and Rubber Cement Products, Ltd. 35203.

DEHYDRATION OF MIXTURES of carbon dioxide and ammonia.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue. (Germany, Jan. 6.) 35167.

PLASTIC SELF-HARDENING COMPOSITIONS.—P. P. B. Cormac, and Rubber Cement Products, Ltd. 35202, 35204, 35205.

PRODUCTION OF GLUTAMIC ACID, ETC.—Corn Products Refining Co. (United States, Dec. 6, '37.) 35560.

TREATMENT OF MIXED CARBIDES OF TANTALUM and niobium.—F. Cuvelliez, and Soc. Generale Metallurgique de Hoboken. 34998.

MANUFACTURE OF HIGH-MOLECULAR KETENES.—Deutsche Hydrierwerke, A.-G. (Germany, Dec. 2, '37.) 35210.

PROCESS FOR RENDERING TEXTILES, ETC., WATER REPELLENT.—Deutsche Hydrierwerke, A.-G. (Germany, Dec. 4, '37.) 35211.

PRODUCTION OF CALCIUM-SULPHATE.—E. I. du Pont de Nemours and Co. (United States, Dec. 2, '37.) 35059.

LUBRICANTS, ETC.—E. I. du Pont de Nemours and Co. (United States, Dec. 3, '37.) 35450, 35451.

MANUFACTURE OF CHLOROSULPHONATES.—E. I. du Pont de Nemours and Co. 35710.

SULPHURIC ACID ESTER SALTS OF LEUCO VAT DYESTUFFS.—E. I. du Pont de Nemours and Co., M. A. Prahl, and W. L. Rintelman. 35549.

REMOVAL OF GAS from organic liquids.—Eastman Kodak Co. (United States, Dec. 1, '37.) 34949.

MANUFACTURE OF ACTIVE CARBON.—Gas Light and Coke Co., and H. W. Cartwright. 35007.

MANUFACTURE OF CONDENSATION PRODUCTS.—J. R. Geigy, A.-G. (Switzerland, Dec. 6, '37.) 35386.

MANUFACTURE OF SOLID MOLECULAR COMPOUNDS of alkylpurines. W. W. Groves (I. G. Farbenindustrie.) 35372.

ALUMINIUM ALLOY.—H. C. Hall. 35234.

MANUFACTURE, ETC., OF ARTIFICIAL RUBBER.—I. G. Farbenindustrie. (Germany, Dec. 3, '37.) 35224.

PROCESS OF REMOVING PHOSPHORUS and arsenic compounds from vanadate solutions.—I. G. Farbenindustrie. (Germany, Feb. 12.) 35446.

CATALYTIC POLYMERISATION OF OLEFINES.—I. G. Farbenindustrie. (Germany, Dec. 6, '37.) 35583.

PREPARATION OF ZINC, ETC.—I. G. Farbenindustrie. (Germany, Dec. 24, '37.) 35573.

MANUFACTURE OF POLARISING MATERIALS.—International Polaroid Corporation. (United States, Dec. 4, '37.) 35427.

PRODUCTION OF 5-PYRAZOLONE-4-SULPHONIC ACIDS, ETC.—H. P. Kaufmann. 35320.

PRODUCTION OF SOAP.—A. W. Keeble. 35411.

DEVICE FOR THE CONTINUOUS DIALYSIS IN COUNTER-CURRENT OF LIQUIDS containing substances in a colloidal state.—G. W. van B. Kooy. (Germany, Dec. 8, '37.) 35692.

CARBIDE SUBSTANCES.—P. M. McKenna. (United States, Dec. 13, '37.) 35447.

HARD COMPOSITIONS containing metallic carbides.—P. M. McKenna. (United States, Dec. 13, '37.) 35448, 35449.

PREPARATION OF DERIVATIVES OF P-AMINOBENZENESULPHONIC-ANILIDES.—K. Merck, L. Merck, W. Merck, and F. Merck. (Germany, Jan. 25.) 35698.

UTILISATION OF PULVERENT, ETC., CARBONACEOUS MATERIALS.—F. G. Mitchell, and J. E. Temple. 35169.

PREPARATION OF ALKENE DERIVATIVES.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, Dec. 17, '37.) 35194.

PREPARATION OF CYCLIC HYDROCARBONS from aliphatic hydrocarbons.—Naamlooze Vennootschap de Bataafsche Petroleum Mattschappij. (Holland, Dec. 17, '37.) 35561.

PREPARATION OF LEAD SULPHATE PRODUCTS.—National Lead Co. (United States, Dec. 6, '37.) 35535.

METHOD OF PRODUCING HYDRATED CALCIUM SILICATE MINERALS, ETC.—A. W. Parfitt (Gypsum, Lime and Alabastine, Canada, Ltd.). 35366.

WORKING UP OF RESIDUES of the hydrogenation under pressure of distillable carbonaceous materials.—H. E. Potts (Naamlooze Vennootschap Internationale Hydrogeneeringsoctrooien Maatschappij). 35247.

DESTRUCTIVE HYDROGENATION OF CARBONACEOUS MATERIALS, ETC. H. E. Potts (Naamlooze Vennootschap Internationale Hydrogeneeringsoctrooien Maatschappij). 35248.

MANUFACTURE OF PRODUCTS from polyvinyl compounds.—Siemens-Schuckertwerke, A.-G. (April 1.) 35422.

MANUFACTURE OF QUINHYDRONES.—Soc. of Chemical Industry in Basle. (Switzerland, Dec. 6, '37.) 35513; (Switzerland, July 11.) 35514; (Switzerland, Nov. 10.) 35515.

MANUFACTURE OF ORTHO-DINITRILES OF CYCLIC ORTHO-DICARBOXYLIC ACIDS.—Soc. of Chemical Industry in Basle. (Switzerland, Dec. 14, '37.) 35669; (Switzerland, Nov. 10.) 35670.

MANUFACTURE OF 1-4-5-8-TETRA-AMINOANTHRAQUINONE.—Soc. Rhodiaceta. (France, Dec. 24, '37.) 35180, 35183.

MANUFACTURE OF MOTOR FUEL.—Standard Oil Development Co. (United States, March 11.) 35014.

ALUMINIUM ALLOYS, ETC.—J. Stone and Co., Ltd., A. J. Murphy, and S. A. E. Wells. 35020

METHOD OF PREPARING, ETC., CHINA CLAY, ETC., for use in manufacture of paper, etc.—L. Wolf. 35597.

Complete Specifications Open to Public Inspection

PROCESS FOR THE MANUFACTURE OF THERAPEUTICALLY VALUABLE SULPHO COMPOUNDS.—Schering, A.-G. June 1, 1937. 16286/38.

AMINOBENZYL ACYL AMINES.—J. R. Geigy, A.-G. June 3, 1937. 16541/38.

RECOVERY OF ODOURLESS SOAP-FORMING FATTY ACIDS.—I. G. Farbenindustrie. June 2, 1937. 16582/38.

PROCESS FOR THE MANUFACTURE OF KETOSTEROIDS.—Schering, A.-G. June 3, 1937. 16594/38.

PRODUCTION OF ALKAMINE ESTERS.—Chemische Fabriken Dr. J. Wiernik and Co., A.-G. June 5, 1937. 16750/38.

SEPARATING PHENOLS FROM TAR OILS and like products.—H. Wittek. June 5, 1937. 16878/38.

MANUFACTURE OF MELAMINE.—A. G. Bloxam. June 5, 1937. 16879/38.

MANUFACTURE OF KETONES or their enol derivatives.—Soc. of Chemical Industry in Basle. June 5, 1937. 16967/38.

COMplete SpecificationS AccepteD. — — —

PRODUCTION OF CELLULOSE.—S. Marsoni. June 11, 1937. 5910/38.

MANUFACTURE OF CALCIUM CARBIDE in electric furnaces.—A.-G. Fur Stickstoff-Dunger. March 27, 1937. 7855/38.

ELECTRODEPOSITION OF METALS.—E. I. du Pont de Nemours and Co. June 11, 1937. 10863/38.

PRODUCTION OF BASIC CALCIUM HYPOCHLORITE.—I. G. Farbenindustrie. June 8, 1937. 13366/38.

DECHLORINATING HYDROCARBONS.—Ruhrchemie, A.-G. June 10, 1937. 13862/38

DETERGENT COMPOSITIONS.—Colgate-Palmolive-Peet Co. June 10, 1937. 14854/38.

PROCESS FOR THE MANUFACTURE OF AN ALDOL CONDENSATION PRODUCT from carbonyl compounds.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. June 12, 1937. 16292/38.

CATALYSTS.—R. Auchter. June 7, 1937. 16860/38.

MANUFACTURE OF CONDENSATION PRODUCTS.—British Celanese, Ltd. June 9, 1937. 16890/38.

PREPARATION OF COATING-COMPOSITIONS.—Beck, Koller and Co. (England), Ltd. June 10, 1937. 16958/38.

PRODUCTION AND APPLICATION OF MASSES consisting of polybutylene and filling substances which are suitable for rolling and pressing.—Siemens and Halske, A.-G. June 7, 1937. 16962/38.

BREAKING OF EMULSIONS.—I. G. Farbenindustrie. June 8, 1937. 17018/38.

PRODUCTION OF AMMONIUM SULPHATE.—Directie van de Staatsmijnen in Limburg. June 9, 1937. 17030/38.

MANUFACTURE OF FUELS.—J. Beaudequin, and A. Wormser. June 10, 1937. 17050/38.

PROCESS FOR THE MANUFACTURE OF PHTHALOCYANINE SULPHONIC ACID CHLORIDES.—I. G. Farbenindustrie. June 8, 1937. 17071/38.

MANUFACTURE OF HYDROGEN PEROXIDE.—A. C. Semidei. June 9, 1937. 17213/38.

MANUFACTURE OF AZODYESTUFFS.—I. G. Farbenindustrie. June 9, 1937. 17216/38.

PRODUCTION OF VINYL ACETYLENE.—Consortium fur Elektrochemische Industrie Ges. June 11, 1937. 17363/38.

HYDROGENATION OF LIQUID OLEFINE POLYMERS.—Naamlooze Vennootschap Internationale Hydrogeneerings Octrooien Maatschappij. June 11, 1937. 17485/38.

PREPARATION OF LACTONES.—H. Hunsdiecker, H. Erlach, and E. Vogt. June 12, 1937. 17513/38.

PROCESS FOR THE MANUFACTURE OF AN ALDOL CONDENSATION PRODUCT from carbonyl compounds.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. June 12, 1937. 29866/38.

Specifications Accepted with Date of Application

PRODUCTION OF COMPOSITIONS having antiseptic, disinfectant, germicidal, insecticidal, and the like properties.—F. Koenigsberger. March 3, 1937. 496,543.

WATERPROOFING OF TEXTILE FIBRES, fabrics, and the like.—E. B. Higgins. May 28, 1937. 496,490.

COLOURING AND WATERPROOFING OF TEXTILE FIBRES, fabrics, and like materials.—E. B. Higgins. May 28, 1937. 496,491.

PROCESS FOR THE MANUFACTURE OF ALKENE TRITHIO-CARBONATES. H. E. Girling (Legal representative of H. D. Elkington (deceased)). (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). May 29, 1937. 496,290.

MANUFACTURE OF HYDROCARBONS from carbon monoxide and hydrogen.—H. Dreyfus. May 29, 1937. 496,292.

LUBRICANTS.—H. W. Brownsdon, and Imperial Chemical Industries, Ltd. May 31, 1937. 496,717.

PROCESS FOR THE MANUFACTURE OF DRY ICE.—A. Argyriades. June 2, 1936. 496,571.

CATALYTIC PRODUCTION OF HYDROCARBONS.—Ruhrchemie, A.-G. Oct. 5, 1936. 496,718.

PRODUCTION OF ARTIFICIAL MATERIALS FROM HIGHLY POLYMERIC COMPOUNDS.—I. G. Farbenindustrie. June 16, 1936. 496,574.

CUPRONICKEL ALLOYS.—Revere Copper and Brass, Inc. Dec. 24, 1936. 496,575.

PROCESS FOR THE MANUFACTURE OF VAT DYESTUFFS of the anthraquinone-acridone series.—A. Carpmael (I. G. Farbenindustrie.) June 1, 1937. 496,652.

MANUFACTURE OF PYRIMIDINE THIAZOLIUM COMPOUNDS.—Research Corporation. June 15, 1936. 496,726.

CATALYSTS.—Baker and Co., Inc. June 2, 1936. 496,579.

MANUFACTURE OF ACID GREEN TRIPHENYLMETHANE DYESTUFFS.—I. G. Farbenindustrie, and W. W. Groves. June 2, 1937. 496,580.

MANUFACTURE OF ACID TRIPHENYLMETHANE DYESTUFFS.—I. G. Farbenindustrie, and W. W. Groves. June 2, 1937. 496,657.

PROCESS FOR THE MANUFACTURE OF FLUORO-SULPHONIC ACID.—I. G. Farbenindustrie. June 11, 1936. 496,658.

PIGMENT PASTES and pigmented lacquers.—I. G. Farbenindustrie. June 5, 1936. 496,660.

PRODUCTION OF BUTYL ALCOHOL and associated products by fermentation.—W. A. Burton (Commercial Solvents Corporation). June 3, 1937. 496,661.

PROCESS FOR THE MANUFACTURE OF DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) June 3, 1937. 496,663.

MANUFACTURE OF FILMS, threads, or the like from polymerides.—Deutsche Celluloid-Fabrik. June 11, 1936. 496,665.

AROMATIC OXYKETONE ARSENICALS and a process of making them. L. Mellersh-Jackson (Parke, Davis, and Co.). June 4, 1937. 496,733.

PROCESS FOR THE MANUFACTURE OF WATER-INSOLUBLE AZO DYESTUFFS in substance or on the fibre.—A. Carpmael (I. G. Farbenindustrie.) June 4, 1937. 496,735.

MANUFACTURE OF CELLULOSE ESTERS.—British Celanese, Ltd. June 5, 1936. 496,671.

PROCESSES FOR THE MANUFACTURE OF HYDRIDES of the alkali earth metals.—D. Gardner. June 7, 1937. 496,294.

PROCESSES FOR THE MANUFACTURE OF CARBIDES of the alkali earth metals.—D. Gardner. June 7, 1937. 496,295.

PROCESS FOR THE MANUFACTURE OF ISOBUTENE or derivatives thereof.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. June 27, 1936. 496,676.

DISTILLATION OF HIGH BOILING LIQUIDS such as fatty acids.—Colgate-Palmolive-Peet Co. June 11, 1936. 496,677.

MANUFACTURE AND PRODUCTION OF OXIDES of nitrogen.—G. W. Johnson (I. G. Farbenindustrie.) June 8, 1937. 496,587.

DYEING AND PRINTING CELLULOSE ESTERS and ethers.—G. W. Johnson (I. G. Farbenindustrie.) June 9, 1937. 496,678.

MANUFACTURE AND PRODUCTION OF DYESTUFFS of the phthalocyanine series.—G. W. Johnson (I. G. Farbenindustrie.) June 18, 1937. 496,683.

MANUFACTURE OF SUBSTITUTED PRODUCTS of cyclic amidines.—A. Carpmael (I. G. Farbenindustrie.) July 14, 1937. 496,690.

MANUFACTURE OF CELLULOSE.—Soc. Anon. Manifattura Di Altessano. Sept. 3, 1936. 496,312.

ENRICHMENT OF NATURAL AND INDUSTRIAL MIXTURES of hydrocarbons in aromatic hydrocarbons and the elimination of the resin-producing constituents therefrom.—A. E. J. L. Germe. Sept. 9, 1936. 496,607.

APPARATUS FOR THE MANUFACTURE AND PRODUCTION OF EPICHLORHYDRIN.—G. W. Johnson (I. G. Farbenindustrie.) Oct. 5, 1937. 496,709.

BASIC DERIVATIVES OF FATTY ACIDS and a process for their manufacture.—Chemical Works, formerly Sandoz. Oct. 23, 1936. 496,611.

MANUFACTURE AND PRODUCTION OF BUTANOL by fermentation.—G. W. Johnson (I. G. Farbenindustrie.) Nov. 15, 1937. 496,428.

MANUFACTURE OF LUBRICATING-GREASE.—C. Arnold (Standard Oil Development Co.). Nov. 29, 1937. 496,331.

REMOVAL OF CARBONIC ACID from gas by washing.—O. Bormann. Dec. 5, 1936. 496,431.

PRODUCTION OF ANTI-CORROSIVE PIGMENTS.—R. S. Carreras. Jan. 15, 1937. 496,433.

TREATMENT OF FABRICS comprising derivatives of cellulose.—British Celanese, Ltd. Dec. 30, 1936. 496,336.

PURIFICATION OF CARBON OR GRAPHITE.—Dow Chemical Co. Aug. 27, 1937. 496,615.

FORMING AN ACID-PROOF COATING ON ALUMINIUM METAL or aluminium alloy.—H. Hongo. Jan. 17, 1938. 496,436.

MANUFACTURE OF TETRACHLORETHYLENE.—Dr. A. Wacker Ges. Fur Elektrochemische Industrie Ges. Feb. 22, 1937. 496,348.

CLEANSING OR DE-GREASING ARTICLES OF RIGID MATERIAL.—Dr. A. Wacker Ges. Fur Elektrochemische Industrie Ges. Oct. 18, 1937. 496,349.

MANUFACTURE OF TETRACHLORETHYLENE.—Dr. A. Wacker Ges. Fur Elektrochemische Industrie Ges. June 19, 1937. 496,352.

PREPARATION OF SIZE SOLUTIONS and size compositions containing salts of cellulose ether carboxylic acids as their essential constituent.—F. Sichel, A.-G. March 1, 1937. 496,354.

TREATMENT OF RIGID GOODS with volatile organic solvents and apparatus therefor.—Dr. A. Wacker Ges. Fur Elektrochemische Industrie Ges. May 4, 1937. 496,357.

ODOURLESS AND TASTELESS RESIN and method of producing same. Atlas Powder Co. June 29, 1937. 496,444.

PRODUCTION OF WROUGHT GOODS of magnesium base alloys.—Magnesium Elektron, Ltd. June 7, 1937. 496,539.

MANUFACTURE OF PYRIMIDINE COMPOUNDS.—Research Corporation. June 15, 1936. 496,738.

PROCESS FOR THE MANUFACTURE OF PRODUCTS FROM POLYVINYL COMPOUNDS.—Siemens-Schuckertwerke, A.-G. May 18, 1936. 497,001.

MANUFACTURE OF AZO-DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) June 2, 1937. (Convention date not granted.) 496,879.

Chemical and Allied Stocks and Shares

SINCE the commencement of the new Stock Exchange account on Monday there has been no change in the general position of the stock and share markets. Partly owing to the influence of holiday considerations, very little business has been passing and the trend has been to lower prices. Nevertheless, on balance movements against holders were relatively moderate and no heavy selling pressure was reported.

Imperial Chemical ordinary are 30s. at the time of writing, compared with 30s. 7½d. a week ago, while the 7 per cent. preference have been well maintained at 31s. Fison Packard and Prentice were a steady feature at 38s. 9d., and B. Laporte were again quoted at 85s. Borax Consolidated deferred had a rather more active appearance and at 27s. show an improvement of 6d. on balance. Turner and Newall have gone back sharply to 75s. 6d., but are now "ex" the recently-declared dividend. Lever and Unilever, which fluctuated moderately, are 36s. 3d., compared with 36s. 9d. a week ago.

Boots Pure Drug were little changed at 39s., and Timothy Whites at 23s. 1½d. are within 3d. of the price ruling a week ago, while Sangers although "ex" the interim dividend are 21s. 9d., which compares with 22s. a week ago. Swedish Match at 27s. 9d. were little changed on balance, but International Nickel fluctuated rather sharply in common with most dollar shares which move closely with New York markets.

United Molasses at 21s. 3d. were well maintained, aided by the favourable impression created by the meeting, where it was indicated that in the course of time there may be a bonus in the form of a writing up of the nominal value of the ordinary stock units. United Steel, Colvilles, Dorman Long and other shares of steel producers failed to attract much attention, the disposition being to await indications as to the effect of the lower steel prices which come into force next month. Wall Paper deferred units were dull at 33s., and Pinchin Johnson and various other shares of paint manufacturing companies were moderately lower in price. British Match were a very steady feature at 33s. 6d. Barry and Staines were lower at 35s., and Michael Nairn were 60s. Results of the last-named company are due next month. General Refractories were little changed at 11s. 3d., it being realised that it is difficult at this stage to assess prospects because much may depend on the trend in the steel industry, which is the company's largest customer. Triplex Glass ordinary units had a steadier appearance and are 31s. at the time of writing. Cement shares were again reactionary and Associated Cement at 67s. 6d., have lost a further 1s. 3d. British Plaster Board were steady at 27s. 6d.

British Aluminium were steady around 54s. 3d., aided by the hope that there are good possibilities of the dividend being maintained in view of the indications of growing demand for aluminium for aircraft production and many other purposes. Tube Investments made a rather higher price and Murex regained part of an earlier decline. Imperial Smelting were dull at 10s. 1½d. Among smaller priced shares Blythe Colour Works were unchanged at 8s., and William Blythe 3s. shares were again quoted at 5s. Greeff-Chemicals Holdings ordinary units transferred at 5s. 3d. Monsanto Chemicals 5½ per cent. preference shares were maintained at 22s. 6d.

Oil shares were uncertain and are mostly lower on balance, the disposition being to await the Royal Dutch and "Shell" interim dividend decisions.

Weekly Prices of British Chemical Products

MOVEMENTS in the general chemical market this week have been on a small scale, interest being rather subdued by the approach of the Christmas holidays. There are no outstanding price changes to record for general chemicals, rubber chemicals and wood distillation products and values for most items are on a steady basis. There has been a fair weight of forward buying covering deliveries over the first six months of 1939, and in some instances for longer periods. Dull conditions continue to prevail in the coal tar section, the market being without feature.

Price Changes

Falls: Potash, Caustic (Manchester); Naphthalene, purified crystals.

MANCHESTER.—Business in chemical products on the Manchester market during the past week has been markedly under the influence of the approaching holidays. Traders continue to report additions to order books for delivery over varying periods of next year of the principal bread-and-butter lines of chemicals, but in other respects business has been quiet, with some contraction, also, in the flow of delivery specifications. The latter is due to the holidays and also to stocktaking operations, and is the customary experience at about this time of the year. With regard to prices these are mostly on a steady basis and are expected to continue so over the early months of next year, at all events.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £18 10s. per ton, d/d U.K. Fine white, 98%, £17 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4½d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2¾d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11¼d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. SCOTLAND: B.P. crystals, 1s. 0¼d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £19 7s. 6d. per ton f.o.b. SCOTLAND: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £3 17s. 6d. to £4 17s. 6d. per cwt. according to quantity; in drums, £3 10s. 0d. to £4 2s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£31 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2¼% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £31 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.), 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip), 7s.; levig., 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3½d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £38 10s. 6d.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 per ton.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¼d. to 10¼d. per lb. SCOTLAND: B.P. Crystals, 10¼d. MANCHESTER: B.P. 9¼d. to 11¼d.

POTASSIUM PRUSSIATE.—5¼d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6¼d. to 6¾d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

Soda, Caustic.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. **Scotland**: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

Soda Crystals.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

Sodium Acetate.—£19-£20 per ton carriage paid North. **Glasgow**: £18 10s. per ton net ex store.

Sodium Bicarbonate.—Refined spot, £10 15s. per ton d/d station in bags. **Glasgow**: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. **Manchester**: £10 15s.

Sodium Bisulphite Powder.—60/62%, £14 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£27 10s. to £32 per ton. **Glasgow**: £1 11s. per cwt., minimum 3 cwt. lots.

Sodium Dichromate.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.

Sodium Chromate.—4½d. per lb. d/d U.K. 4d. per lb. **Glasgow**: 4½d. net, carriage paid.

Sodium Hyposulphite.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. **Manchester**: Commercial, £11; photographic, £15 10s.

Sodium Metasilicate.—£14 5s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £8 per ton for 6-ton lots d/d. **Glasgow**: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

Sodium Nitrite.—£18 5s. per ton for ton lots.

Sodium Perborate.—10%, 9½d. per lb. d/d in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.

Sodium Prussiate.—d. per lb. for ton lots. **Glasgow**: 5d. to 5¾d. ex store. **Manchester**: 4¼d. to 5d.

Sodium Silicate.—£8 2s. 6d. per ton.

Sodium Sulphate (Glauber Salts).—£3 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. **Scotland**: Ground quality, £3 5s. per ton d/d. **Manchester**: £3 12s. 6d.

Sodium Sulphide.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. **Manchester**: Concentrated solid, 60/62%, £11; commercial, £8 10s.

Sodium Sulphite.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

Sulphur Precip.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

Sulphuric Acid.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

Tartaric Acid.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. **Manchester**: 1s. 1¼d. per lb. **Glasgow**: 1s. 1½d. per lb., 5%, ex store.

Zinc Sulphate.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

Antimony Sulphide.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

Arsenic Sulphide.—Yellow, 1s. 5d. to 1s. 7d. per lb.

Barytes.—£6 to £6 10s. per ton, according to quality.

Cadmium Sulphide.—3s. 1d. to 3s. 4d. per lb.

Carbon Black.—3¾d. to 4 1/16d. per lb., ex store.

Carbon Disulphide.—£31 to £33 per ton, according to quantity, drums extra.

Carbon Tetrachloride.—£41 to £46 per ton, according to quantity, drums extra.

Chromium Oxide.—Green, 10½d. to 11½d. per lb.

Diphenylguanidine.—2s. 2d. per lb.

India-rubber Substitutes.—White, 4½d. to 5½d. per lb.; dark 3½d. to 4½d. per lb.

Lamp Black.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

Lead Hyposulphite.—9d. per lb.

Lithopone.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

Sulphur.—£9 to £9 5s. per ton. **Sulphur precip.** B.P., £55 to £60 per ton. **Sulphur precip. comm.**, £50 to £55 per ton.

Sulphur Chloride.—5d. to 7d. per lb., according to quantity.

Vermilion.—Pale, or deep, 5s. per lb., 1-cwt. lots.

Zinc Sulphide.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

Ammonium Sulphate.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

Calcium Cyanamide.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.

Nitro Chalk.—£7 10s. 6d. per ton up to June 30, 1939.

Sodium Nitrate.—£8 per ton for delivery up to June 30, 1939.

Concentrated Complete Fertilisers.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

Ammonium Phosphate Fertilisers.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

Benzol.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. **Glasgow**: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. **Manchester**: Pure, 1s. 8d. per gal.; crude, 11½d. per gal.

Carbolic Acid.—Crystals, 6¾d. to 7¾d. per lb., small quantities would be dearer; Crude, 60's, 1s. 7½d. to 1s. 10½d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.

Creosote.—Home trade, 3¾d. to 4d. per gal., f.o.r. makers' works; exports 6d. to 6¼d. per gal., according to grade. **Manchester**: 3¾d. to 4¼d. **Glasgow**: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5¾d. to 6¼d.

Cresylic Acid.—97/99%, 1s. 8d. to 1s. 11d.; 99/100%, 2s. 6d. to 3s. 6d. per gal., according to specification; Pale, 99/100%, 1s. 10d. to 2s.; Dark, 95%, 1s. 5d. to 1s. 6d. per gal. **Glasgow**: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. **Manchester**: Pale, 99/100%, 1s. 9d.

Naphtha.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. **Glasgow**: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

Naphthalene.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £10 per ton in 2-cwt. bags. **London**: Fire lighter quality, £3 to £4 10s. per ton. **Glasgow**: Fire lighter, crude, £6 to £7 per ton (bags free). **Manchester**: Refined, £12 to £13 per ton f.o.b.

Pitch.—Medium, soft, 30s. per ton, f.o.b. **Manchester**: 30s. f.o.b., East Coast. **Glasgow**: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

Pyridine.—90/140%, 12s. to 14s. per gal.; 90/160%, 10s. to 10s. 6d. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. **Glasgow**: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. **Manchester**: 11s. to 14s. per gallon.

Toluol.—90%, 1s. 11d. per gal.; pure 2s. 3d. **Glasgow**: 90% 120, 1s. 10d. to 2s. 1d. per gal. **Manchester**: Pure, 2s. 3d. per gallon, naked.

Xylol.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 3½d. **Glasgow**: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £6 15s. to £9 5s. per ton; grey, £8 5s. to £8 10s. **Manchester**: Brown, £8 10s.; grey, £10.

Methyl Acetone.—40.50%, £32 to £35 per ton.

Wood Creosote.—Unrefined, 6d. to 8d. per gal., according to boiling range.

Wood Naphtha, Miscible.—2s. 8d. to 3s. per gal.; solvent, 3s. to 3s. 3d. per gal.

Wood Tar.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.

Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.

Benzidine, HCl.—2s. 7½d. per lb., 100% as base, in casks.

Benzoic Acid, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

***m*-Cresol 98/100%.**—1s. 8d. to 1s. 9d. per lb. in ton lots.

***o*-Cresol 30/31° C.**—6½d. to 7½d. per lb. in 1-ton lots.

***p*-Cresol, 34-5° C.**—1s. 7d. to 1s. 8d. per lb. in ton lots.

Dichloraniline.—2s. 1½d. to 2s. 5d. per lb.

Dimethylaniline.—Spot, 1s. 7½d. per lb., package extra.

Dinitrobenzene.—7½d. per lb.

Dinitrochlorbenzene, Solid.—£79 5s. per ton.

Dinitrotoluene.—48/50° C., 8½d. per lb.; 66/68° C., 11d.

Diphenylamine.—Spot, 2s. 2d. per lb., d/d buyer's works.

Gamma Acid, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H Acid.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

Naphthionic Acid.—1s. 10d. per lb.

β-Naphthol.—£97 per ton; flake, £94 8s. per ton.

***α*-Naphthylamine.**—Lumps, 1s. 1d. per lb.

β-Naphthylamine.—Spot, 3s. per lb.; d/d buyer's works.

Neville and Winther's Acid.—Spot, 3s. 3½d. per lb. 100%.

***o*-Nitraniline.**—4s. 3½d per lb.

***m*-Nitraniline.**—Spot, 2s. 10d. per lb. d/d buyer's works.

***p*-Nitraniline.**—Spot, 1s. 10d. to 2s. 1d. per lb. d/d buyer's works.

Nitrobenzene.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

Nitronaphthalene.—9½d. per lb.; P.G., 1s. 0½d. per lb.

Sodium Naphthionate.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

Sulphanilic Acid.—Spot, 8¾d. per lb. 100%, d/d buyer's works.

***o*-Toluidine.**—10½d. per lb., in 8/10 cwt. drums, drums extra.

***p*-Toluidine.**—1s. 10½d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 3d. per lb., 100%.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALUMINIUM PRODUCTS, LTD., West Bromwich. (M.C., 24/12/38.) Dec. 8, £400 debenture, to C. A. Miller, Sutton Coldfield; general charge.

UNOPOL PRODUCTS, LTD., Chertsey, polish manufacturers. (M.C., 24/12/38.) Dec. 12, £100 debentures, part of a series already registered.

McCLURE YOUNG AND CO., LTD., London, N.W., disinfectant manufacturers. (M.C., 24/12/38.) Satisfaction Dec. 9, of mortgage registered March 31, 1933.

Company Winding-up Voluntarily

THOMAS HARDMAN AND SONS, LTD. (C.W.U.V., 24/12/38.) Dec. 12 (members), it being desirable to reconstruct the company. A. Chadwick, 16 Bolton Street, Bury, liquidator. This is a members voluntary winding-up and all creditors will be paid in full.

Declaration of Solvency Filed

THOMAS HARDMAN AND SONS, LTD. (old company). (D.S.F., 24/12/38.) Bury, woollen manufacturers. Dec. 10.

Receiverships

UNOPOL PRODUCTS, LTD., Chertsey, polish manufacturers. (R., 24/12/38.) J. Crichton-Helme, 27 Chancery Lane, W.C., has been appointed receiver and manager. Dec. 12.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Morocco.—H.M. Consul at Casablanca reports that La Pharmacie Centrale de la Santé et de l'Hygiène Publiques, Casablanca, is calling for tenders for the supply and delivery of 600 kilos of basic chlorhydrate of quinine and 1,500 kilos of bisulphate of quinine, to conform to the requirements of the French pharmacopoeia. Tenders should be addressed to La Pharmacie Centrale de la Santé et de l'Hygiene Publiques, 24 Rue des Ouled Ziane, Casablanca, Morocco, where they will be received up to January 4, 1939. All telephonic communications with the Department of Overseas Trade in regard to this tender should be addressed exclusively to Extension 253.

Canada.—A well-established firm of importers and agents at Lachine, P.Q., wishes to obtain the representation, on a purchasing basis, of United Kingdom manufacturers of tannic acid for the Dominion. (Ref. No. 444.)

South Africa.—A firm of agents established at Durban wishes to obtain the representation, on a purely commission basis, of United Kingdom manufacturers of raw materials for the paint industry for the Union of South Africa. (Ref. No. 449.)

British India.—A well-established firm of agents at Bombay wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of patent medicines, chemicals, drugs, for the Bombay Presidency. (Ref. No. 439.)

British India.—A firm of agents established in Bombay wishes to obtain the representation, on a purchasing and consignment basis, of United Kingdom manufacturers of heavy chemicals for India. (Ref. No. 440.)

Company News

Yorkshire Dyeware and Chemical Co., Ltd., have declared an interim dividend of 5 per cent. (the same).

United Indigo and Chemical Co., Ltd., have declared a final preference dividend of 2½ per cent. for the six months ending December 31, 1938.

English Clays Lovering Pochin and Co., Ltd., are recommending a dividend of 2 per cent. for the year ended September 30. Profits for the year amounted to £101,869 (£156,671).

Van Den Berghs and Jurgens, Ltd., controlled by Lever Brothers and Unilever, Ltd., have declared an interim dividend of 4 per cent., less tax, on the ordinary shares (same).

International Options, Ltd., pharmaceutical, manufacturing and general chemists and druggists, etc., have increased their nominal capital by the addition of £1,000 in £1 ordinary shares, beyond the registered capital of £2,000.

Savory and Moore, Ltd., propose purchasing part of the undertaking of Pharmaceutical Products, Ltd., whose issued ordinary shares they own. It is proposed that the purchase consideration shall be £160,000, which is to be satisfied by the allotment to Pharmaceutical Products of 160,000 new fully-paid redeemable preference shares of £1 each, carrying a fixed non-cumulative dividend of 6 per cent. To sanction the necessary increase of capital and approve the sale, an extraordinary general meeting will be held on January 10. An extraordinary general meeting of Pharmaceutical Products will be held on the same day for approval of the sale.

Alpha Cement, Ltd.—An extraordinary general meeting of the company held last week, sanctioned alterations in the articles arising out of the acquisition of the ordinary share by the Associated Portland Cement Manufacturers, Ltd., and the Tunnel Portland Cement Co.

United Match Industries, Ltd., report for the year ended October 31, net profits of £15,130 (£13,111). Dividends of 10.2507 per cent. on the non-cumulative participating preferred ordinary shares, and 50 per cent. on the deferred ordinary shares, have been recommended. The meeting is on December 29.

Monsanto Chemicals, Ltd., have declared a second ordinary interim dividend of 16⅔ per cent. on account of 1938, making 33⅓ to date (33⅓ per cent. paid for whole year 1937).

New Companies Registered

Parris and Greening (Oxygen Services), Ltd. 346,378.—Private company. Capital, £150 in 150 shares of £1 each. To carry on business as manufacturers of and dealers in oxygen, soda lime, ice, nitrous oxide, chemicals, drugs, medicines, oxygen tents, etc. Directors: Donald W. Hudson, 105 Church Road, Hove; Rosa M. Greening, Robert McNeil. Registered office: 103 Church Road, Hove, Sussex.

Industrial Chemicals, Ltd. 346,228.—Private company. Capital £3,000 in 2,000 15 per cent. cumulative preference shares of £1 and 4,000 ordinary shares of 5s. each. Objects: To carry on the business of manufacturers of, agents for and distributors of chemicals, waterproofing compositions, tar, pitch, creosote, oil and grease, etc. Directors: Geo. C. M. Gardner, "Threeways," Dropmore Road, Burnham, Bucks; Edwd. L. Rabbitt. Registered office: The Paisley Building, Farnham Road, Slough, Bucks.

Coal Consolidation, Ltd. 346,329.—Public company. Capital of £1,000 in 1,000 shares of £1 each. To search for, raise and work coal, iron and other mineral ores, deposits and substances of all kinds; to carry on business, and to acquire and hold interests in any other company carrying on business as proprietors of coal and other mines of all kinds, mining engineers, metallurgists, coke, gas and coal by-product manufacturers, tar distillers, patent and other fuel manufacturers, blast furnace proprietors, ironmasters, steal makers, iron and brass founders, etc. Subscribers: Gordon A. McBean, 15 Moorgate, E.C.2; Charles E. Lovelace.

Rexol Products, Ltd. 346,356.—Private company. Capital £2,500 in 1,000 ordinary shares of 10s., 1,000 7½ per cent. cumulative preference shares of £1 each, and 2,000 6 per cent. participating preference shares of 10s. each. To acquire patents and the like, relating to petroleum and petroleum products and by-products, and to carry on the business of manufacturers, distillers, refiners, importers and exporters of and dealers in petroleum and petroleum products and oils, etc. Directors: Wm. E. Munro, Grange House, Grange Road, S.E.19; Ian Maclean. Registered office: 46 Lincoln Inn Fields, W.C.2.

Thomas Hardman and Sons, Ltd. 347,271.—Public company. Capital £200,000 in 100,000 5½ per cent. cumulative preference shares of £1 and 1,000,000 ordinary shares of 2s. each. To acquire the undertaking, property and assets of Thomas Hardman and Sons, Limited (incorporated in 1894); and to carry on the business of manufacturers of wool, linen, cotton, silk, flax, hemp, jute, worsted, yarn, felt, velvet, plush and all types of machinery cloth, spinners, combers and merchants, top makers, bleachers, dyers, makers of vitriol, bleaching and dyeing materials, etc. Directors: Harold Hardman, Gorsey Clough, Tottington, near Bury; Thomas V. Hardman, Cyril E. Hardman. The registered office is: Fernhill Mills, Bury, Lancs.

B.X. Plastics, Ltd. 347,323.—Private company. Capital £100 in 100 shares of £1 each. To acquire all or part of the undertaking and business of the British Xylonite Company, Ltd., at Brantham, Suffolk, and Hale End, Essex, or all or any of the issued shares of that company, and in particular so much of the undertaking and business as relates to the manufacture and sale of plastic materials, together with the freehold and leasehold premises in which such business is carried on; and to carry on the business of manufacturers of articles made of plastic materials, and component parts thereof, engineers, tool makers, metal workers, glass blowers, chemists, workers in bone, ivory, rubber, wood, glass, vitro-enamel, horn, leather, cotton, wool, silk, printers, photographers, etc. Directors: Charles F. Merriam, Isenhurst, The Bishops Avenue, N.2; Laurence P. B. Merriam, Charles E. M. Coubrough, Foster Sproxton, Thomas L. Birrell. Registered office, Hale End, E.4.